TM 6–215

WAR DEPARTMENT

TECHNICAL MANUAL

ABBREVIATED FIRING TABLES

TECHNICAL MANUAL
No. 6-215

WAR DEPARTMENT,
WASHINGTON, *November 27, 1940.*

ABBREVIATED FIRING TABLES

Prepared under direction of the
Chief of Field Artillery

SECTION I

GENERAL

1. General.—Firing tables contain data pertinent to the application of fire, based on standard trajectories for each type of weapon and combination of projectile, fuze, and propelling charge. A standard trajectory is the one theoretically existing under known, arbitrarily selected conditions of weather, position, and matériel. The amount of important variance that may be expected in a trajectory fired under conditions differing from standard may be computed from the values listed in the tables.

2. Scope.—The tables contained herein are extracts from Firing Tables 75-B-4 for the 75-mm gun, M1897 (and modifications), and from Firing Tables 155-D-2 for the 155-mm howitzer, M1917, M1917A1, M1918, and M1918A1. Of the various combinations of projectile, fuze, and charge available for these weapons, there have been included two combinations for the 75-mm gun and four combinations for the 155-mm howitzer.

273090°—40——1

3. Purpose.—The purpose of this manual is to furnish field artillery students information regarding firing tables and instruction in their use. For the 75-mm gun, the manual includes sufficient data for the solution of problems involving selection and application of the appropriate combination of projectile and fuze for various missions; for the 155-mm howitzer, sufficient data to enable the student to select and apply the appropriate combination of fuze and charge for HE shell within the usual ranges for division artillery.

4. Arrangement.—*a.* Section I contains an explanation of the tables and instructions for their use.

b. Section II contains data applicable to any combination of projectile, charge, and fuze. In it is found—

(1) Conversion factors.

(2) Natural trigonometric functions of angles in mils.

(3) *s* and *d* tables.

(4) Wind-component tables.

(5) Tables and formulas for reducing temperature and density at the altitude of the meteorological datum plane to that at the altitude of the battery.

c. Section III contains tables for the 75-mm gun. It is divided into two parts. One part contains data for shrapnel, Mk. I; the other, data for HE shell, Mk. I, point detonating fuzes M46 and M47. Each part contains three tables: A, B, and C.

(1) Table A contains information on certain elements of a standard trajectory, range and deflection effects of differences from standard, and correction for the angle of site.

(2) Table B gives the change in muzzle velocity due to variations in the temperature of the powder.

(3) Table C gives the deflection effect for cant of axle. (The correction for this effect is not necessary for weapons equipped with sights having cross-leveling bubbles.)

d. Section IV contains tables for the 155-mm howitzer. It is divided into four parts containing data for HE shell, Mk. I, point detonating fuzes M46 and M47, each part containing data for charges 3, 4, 5, and 6, respectively. Each part contains three tables: A, B, and C, containing data as explained in *c* (1), (2), and (3) above.

5. Explanation of tables.—The tables in section II are self-explanatory. The tables of sections III and IV are explained below.

a. Table A.—This explanation is based upon table A for the 75-mm gun firing HE shell, Mk. I, fuzes M46 and M47. An explanation of the variations between this table and the table for other combinations of projectile, fuze, and charge is given in *d* below.

(1) *Column 1.*—The *range* in yards for each hundred yards. The range given in these tables is regarded as measured along the surface of a sphere concentric with the earth and passing through the muzzle of the piece. For practical purposes, the range may be considered as measured along a horizontal plane passing through the piece. All effects throughout a computation are based on this range (to the nearest hundred yards). The determination of one effect is not based upon a range corrected for another effect. For example, the map range being 4123, a range of 4100 would be used throughout the computation as an argument in entering the tables, although the elevation for the map range, 4123, would be determined by interpolation to the nearest tenth of a mil. The algebraic sum of all range corrections is converted to mils of elevation and applied to this map-range elevation, as is the site. The result is the initial quadrant elevation.

(2) *Column 2.*—The *elevation* in mils for the range shown in column 1.

(3) *Column 3.*—The *fork* in mils of elevation. (The fork is the change in elevation for four probable errors change in range.)

(4) *Column 4.*—The *change in elevation* for a 100–yard change in range. (This is *c* and applies to ranges within 50 yards of the tabulated range.)

(5) *Column 5.*—The *change in range* for a 1-mil change in elevation. (Applies to ranges within 50 yards of tabulated range.)

(6) *Column 6.*—The *time of flight* to the level point.

(7) *Column 7.*—The *probable error in range.* (The symbol for range probable error is e_{pr}.)

(8) *Column 8.*—The *probable error in deflection.* (The symbol for deflection probable error is e_{pd}.)

(9) *Column 9.*—The *slope of fall* (the tangent of the angle of fall), expressed as $1/a$, where 1 is the vertical distance and a is the horizontal distance.

(10) *Column 10.*—The *line number of metro message*, indicating the first figure of the seven-figure group to be used for any particular range. The seven-figure group on this line contains those data appropriate for the maximum ordinate of the range considered. The maximum ordinate is not given in table A. Its value in feet may be approximated by squaring the time of flight and multiplying by four. A condensed table of maximum ordinates is given in appendix III.

(11) *Column 11.*—The *deflection effect of drift* in mils. The effect given in these tables includes side jump. Drift proper is always to the right, but the included left side jump effect exceeds the drift effect

in the shorter ranges. (Although a standard trajectory has drift, for convenience drift is considered a deflection effect.)

(12) *Column 12.*—The *deflection effect of a cross wind* of 1 mile per hour. The direction of the effect is given in the wind-components table. A wind from the right causes a *left effect;* a wind from the left, a *right effect.* (See wind-components table and description of metro message.)

(13) *Columns 12 and 15 to 19, inclusive.*—In columns 12 and 15 to 19 are given the *effects of a unit increase* above standard matériel and weather conditions. Range effects of a unit decrease below standard matériel and weather conditions are equal in value but opposite in sign to the effects shown in the table. A condition causing the trajectory to have greater range than standard has a *plus* range effect; one causing the trajectory to fall shorter than standard has a *minus* range effect. A condition causing the trajectory to fall to the right of a standard trajectory has a *right* deflection effect; one causing it to fall to the left, a *left* deflection effect. The range, usually measured from a map or firing chart, is one of the known values or arguments used in determining these effects. It is taken to the nearest 100 yards.

(14) *Columns 13 and 14.*—The *correction* which must be applied to each mil of computed angle of site to compensate for the nonrigidity of the trajectory. It is computed to the nearest hundredth of a mil.

(15) *Column 15.*—The range effect of an increase in weight of projectile of one cross from standard. (See table of projectile weights, sec. III.) For example, a projectile of weight one cross is one cross below standard; the effect is one times that shown in the table and is of the opposite sign.

(16) *Column 16.*—The range effect of an increase of muzzle velocity of 1 foot per second from standard. The sign of the effect is the same as the sign of the variation. (See table B.)

(17) *Column 17.*—The range effect of an increase of air temperature of 1 degree above standard (59° F.).

(18) *Column 18.*—The range effect of a rear wind of 1 mile per hour. The sign of the effect is the same as that of the range component.

(19) *Column 19.*—The range effect of an increase of air density of 1 percent above standard (100%).

(20) *Column 20.*—The *range setting* to be placed on the range scale of a piece firing from the M1897 carriage (and the modifications thereof) in order to reach the range given in column 1.

(21) *Column 21.*—The *range setting* similarly required when firing from the M2 carriage.

(22) *Column 1.—Range.*—Same as in column 1 on the left side; repeated for convenience.

b. Table B.—This table gives the change in muzzle velocity due to variation in the powder temperature. Whenever possible, the actual temperature of the powder should be taken. With fixed ammunition, the temperature of the place where the ammunition is stored at the battery is used. If the temperature cannot be taken at the battery, the air temperature given in the metro message, corrected for the altitude of the battery position, is used as a guide. With the effect obtained from this table, the column headed "Range Effect of Increase of—One foot per second in *MV*" in table A is entered to obtain the final effect in range.

c. Table C.—This table gives the deflection effect of cant of the carriage axle of 10 mils. The effect of any other amount is proportional. The correction is applied to individual pieces by the executive.

d. Variations in tables.—Tables B and tables C for all combinations of projectile, fuze, and charge are similar. Variations in tables A from the arrangement given in *a* above are described below.

(1) *75-mm gun firing shrapnel, Mk. I, 21-second combination fuze.*—Table A contains four additional columns showing—

(*a*) *Column 9.*—The *probable error in height of burst*, expressed in mils.

(*b*) *Column 21.*—The *fuze setting*, in seconds, to produce a graze burst.

(*c*) *Columns 22 and 23.*—The *displacement of the burst* resulting from a change of five points in the corrector.

(*d*) No column of data is given for effect of weight of projectile.

(2) *155-mm howitzer, firing HE shell, Mk. I, fuzes M46 and M47.*—Separate tables are required for each of the seven charges of propelling powder used with this matériel. The tables are the same as those described in *a* above except that columns 20 and 21 (range settings) do not apply and are therefore omitted.

6. The metro message.—*a.* The metro message is a coded tabulation of meteorological conditions on the surface of the earth and at varying zones above it, for use by the Field Artillery in applying these meteorological effects to its firing data. It consists of a group of three letters to designate the sending station, followed by one five-figure group and a series of seven-figure groups, as explained by the table in paragraph 7. If the first figure of the five-figure group is 2, the message applies to antiaircraft or other high-angle fire; if the first figure is 3, the message applies to Field Artillery.

b. Further explanation of the use of the metro message is included in type problems (par. 7).

7. Type problems.—*a. General.*—These tables have been arranged to facilitate a systematic method of determining corrections to map data. A convenient form for recording data is a Data Correction Sheet. (See app. I.) It contains the data for the type problem below.

b. Problems.—Determination of a *new base deflection* and a *new velocity error* (*VE*). The base piece, 75-mm gun M2, is to be adjusted on a check point, using shell Mk. I, normal charge, fuze M46, for the purpose of determining a new base deflection and a new velocity error. The data are recorded in the following order, capitals indicating the major headings on the Data Correction Sheet:

(1) The basic data, determined from a map or chart, are entered wherever indicated.

Map range (to the nearest yard)=4575 yards (initial data).
Altitude of target =1665 feet (initial data).
Altitude of battery =1505 feet (initial data).
Map shift (from base point) =BD R 50 (initial data).
Direction of fire (*Y*-azimuth to nearest 100) =4900 mils (wind components).

(2) Compute the site. The difference in altitude between the target and battery is 160 feet (initial data), plus if the target is above the battery and minus if below. 160/3=+53 yards (initial data). The range is 4600. 53/4.6 equals 11.5, to the nearest tenth of a mil. Target is above battery; therefore, the site is plus 11.5. To correct the site enter table A, column 13, opposite range 4600. The correction for +1 mil angle of site is +0.04 mils. 11.5×0.04=0.5 mils site correction. Now enter, under initial data, site correction +0.5 and corrected site +12.0.

(3) Determine the drift effect from column 11, table A. The correction always is opposite to the effect. Enter drift correction . . . =L5 (initial data).

(4) From table A, determine the elevation corresponding to 4600 (column 2), and the change in elevation for a 100-yard range change (column 4). The elevation for 4575 is computed as follows:

Elevation for 4600	162.2	
25/100×6.0	−1.5	
Elevation for 4575	160.7	(initial data)

(5) The matériel data are as follows:

Weight of projectile (reported by executive)=+++ (range)
Old *VE* (from previous firing) (if known)=+32 f/s (range)

(1)	(2)
Example of metro message	Explanation
MIFMIF	The letter M indicates a metro message; the letters IF are the code designation of the sending station. (The group is usually repeated as indicated.)
31256	The figure 3 indicates a metro message for the Field Artillery; 12 indicates that the MDP (meteorological datum plane) is 1,200 feet above sea level; 56 indicates that the temperature at the MDP is 56° Fahrenheit.

	(3) Zones in height (feet)	(4) Line of metro message	(5) Azimuth of wind (mils)	(6) Velocity of wind (m/h)	(7) Density (%)
0320802	Surface	0	3200	8	102
1351101	Surface to 600	1	3500	11	101
2371499	600 to 1500	2	3700	14	99
3401598	1500 to 3000	3	4000	15	98
4441697	3000 to 4500	4	4400	16	97
5481896	4500 to 6000	5	4800	18	96
6502195	6000 to 9000	6	5000	21	95
7532295	9000 to 12, 000	7	5300	22	95
8562495	12, 000 to 15, 000	8	5600	24	95
9622795	15, 000 to 18, 000	9	6200	27	95
*					

The tabulation above explains the seven-figure groups.

The first figure of each group gives the line number of the metro message, column (4). (Also see column 10, table A.)

The second and third figures, explained in column (5), give the azimuth of the direction from which the ballistic wind blows, measured clockwise from the true North, in hundreds of mils. In computations, this is usually assumed to be the same as *Y*-North.

The fourth and fifth figures give the velocity of the ballistic wind, column (6).

The sixth and seventh figures, explained in column (7), give the ballistic density in percentage of standard. If greater than standard, the first digit does not appear in the metro message; for example, 02 would mean 102, or an increase of 2 percent above normal, while 98 means a decrease of 2 percent below normal. This density must be corrected for the difference in altitude between the battery and the MDP by means of the table for correcting density (p. 18). The density is the mean effective density for the whole layer of atmosphere having a thickness equal to the height given.

* Each additional line refers to an additional 6,000-foot zone in height.

Using powder temperature reported by the executive (40° F.), determine and enter the change in velocity due to powder temperature (table B), as follows:

Pow. temp. 40° F ..... =—40 f/s (range)

(6) From table A, opposite the map range (4600), determine and enter:

Line number of message (from column 10)=2 (corrections, map range)

(7) The following metro message has been received:

MIF MIF

	3	12	35
0	57	25	97
1	59	27	96
2	59	29	96
3	60	32	95
4	60	33	95

From the first line of the metro message, enter:

Altitude of MDP ..... =1200 feet

(Corrections, map range)

Temperature of air ..... =35° F.

(Corrections, map range)

Having previously determined that the seven-figure line beginning with 2 applies, enter:

Wind direction ..... =5,900 mils

(Corrections, map range)

Wind velocity ..... =29 m. p. h.

(Corrections, map range)

Density ..... =96%

(Corrections, map range)

The difference between the altitude of the battery (to the nearest 100 feet) and the altitude of the MDP is (1500—1200) feet and is entered as:

Battery 300 feet above MDP

(Corrections, map range)

Determine the corrected temperature and density, as follows:

Corrected temperature ____ =35−(.2×3)= 34.4° or 34°

(Corrections, map range)

Corrected density ____ =96−(.3×3)=95.1% or 95%

(Corrections, map range)

The variations from normal are entered as follows:

Variation of temperature ____ =(34−59)=−25° F.

(Corrections, map range)

Variation of density ____ =(95−100)=−5%

(Corrections, map range)

(8) Enter the wind direction, adding 6,400 if its value is less than that of the direction of fire, and determine the chart direction (wind-component table, page 17), as follows:

Direction of wind	=5900
Direction of fire (subtract)	=4900
Chart direction	=1000

In the wind-components table opposite chart direction 1000, will be found:

Cross wind for 1 mile per hour	=L .83
Range wind for 1 mile per hour	=−.56

Determine and enter the cross wind and the range wind as follows:

Cross wind____ =L .83×29 (wind velocity)=L 24 miles per hour (deflection).

Range wind____ = −.56×29 (wind velocity) = −16 miles per hour (range).

(9) *Deflection.*—The product of the cross wind (L 24) and the unit effect (.3 mil from column 12, table A) is 7.2 or 7 mils. The effect is left. The correction is Right 7, entered under Initial Data, as: Correction, weather ____ = R 7. The initial deflection can now be totaled. It is BD R 52.

(10) *Range.*—Under Range are entered unit effects, determined from table A, columns 15 to 19 inclusive, opposite 4600 in column 1. (The *VE* mentioned therein is discussed in (12) below.) The product of the variation from normal and the unit effect is determined for each condition and entered in the proper plus or minus column. The sign

in each case is that of the algebraic product; that is, the sign is that of the unit effect if the variation is plus, the opposite if the variation is minus. Thus, the weight of projectile has been given as three crosses. Opposite 4600, in column 15, table A, is found the unit effect, plus 11 (difference of one cross above standard is plus). The effect is in yards, so in the plus column under Range, enter 11 ($1 \times +11$).

(*a*) Old *VE* of plus 32 f/s (column 16, table A, opposite 4600, where plus 2.0 yards is the effect of one f/s) equals 32 times plus 2.0 or plus 64 yards. Enter this in the plus column.

(*b*) Powder temperature 40° (table B) corresponds to a decrease of 40 f/s. Turn again to column 16, table A, and note that minus 40 f/s times the same unit effect of plus 2.0 equals minus 80 yards. Enter this in the minus column under Range.

(*c*) From Corrections, Map Range, where previously have been entered "Cor. temp. $=34 -59 = -25°$", enter, after "Air temp." under Range, the minus 25°. The unit effect of plus 1.6 will be found opposite 4600, table A, in column 17. Plus 1.6 times minus 25 equals minus 40 yards. Enter this value in the minus column.

(*d*) The range wind has been determined as minus 16 m. p. h. In column 18, table A, opposite 4600, will be found a unit effect of plus 5.3 yards for an increase of 1 mile per hour. Since the range wind is minus, plus 5.3 times minus 16 miles per hour equals a minus effect of 85 yards. Enter this value.

(*e*) The density has been determined, under Corrections, Map Range, as minus 5 percent. Enter this value under "Known values" in Range. The unit effect at 4600 appears in column 19, table A, as minus 17 for 1 percent. Minus 17 times minus 5 equals plus 85. Enter this in the plus column.

(*f*) Add the plus and minus columns. The total plus effect is 160 yards; the total minus effect is 205 yards. The difference between the totals of the plus and minus columns gives the net effect; in this case, −45 yards. The correction is opposite, +45 yards. The correction in mils is +45/17 (column 5, table A) which equals +2.6 mils. Under Initial Data, the initial quadrant elevation can now be totaled. It is 175.3 mils.

(11) *Check adjustment.*—Assume that a precision adjustment has been made on the check point and that the following adjusted data therefor have resulted:

Adjusted deflection _____ =BD R 56
Adjusted quadrant elevation =173.2

The deflection to lay the battery on the new base deflection is deter-

mined as indicated on the form. The BC commands: ***BASE DEFLECTION RIGHT 4, RECORD NEW BASE DEFLECTION.*** The method of determining the new *VE* is indicated on the form.

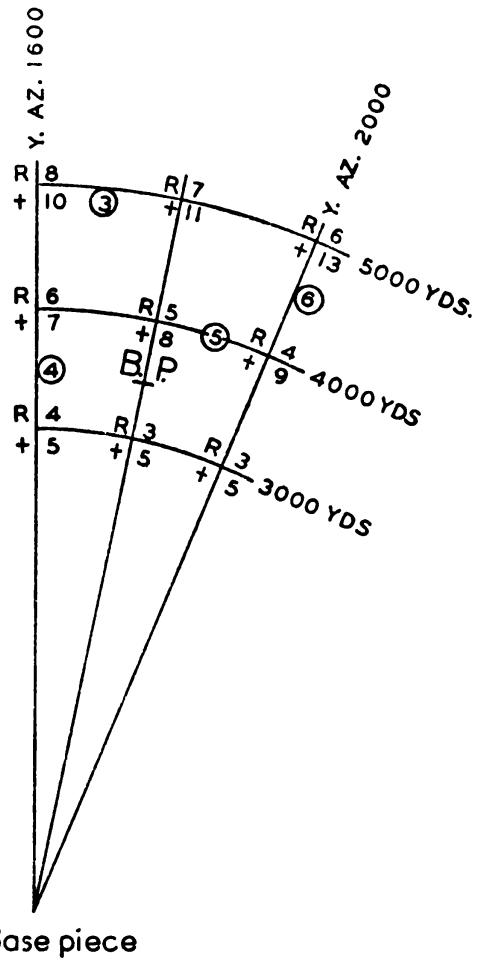
(12) *VE.*—The difference between the computed initial quadrant elevation and the adjusted quadrant elevation accounts for such range errors as could not be foreseen. The difference first appears in mils. From column 5, table A (opposite 4600) it can be converted to range change. (In this example, 2.1 mils becomes 36 yards.) The range change, divided by the range effect for 1 f/s (column 16, table A), or 36/2.0 becomes +18 f/s. The difference existing at a range of 4600 was thus reduced to feet per second of muzzle velocity applicable to any range. The *VE* is an effect. Had this been the first firing from the position with a new powder lot, the type problem would have had no old *VE* under Range. However, an old *VE* determined from previous firing was used in the calculations and a *VE* change and a new *VE* were determined. The algebraic sum of the *VE* change and the old *VE* is a new *VE* of plus 50 f/s. In the calculation of the next problem employing weather corrections, it would be entered as an old *VE* of 50 f/s under Range.

NOTE.—In the example given above, for purposes of simplicity of explanation, each unit effect has been discussed under the correction which it affects. However, after the student gains a clear understanding of the tables, time may be saved if, after step (5) above, all tabular values are taken from the table and entered in the appropriate places on the form. The values in this case would be—

1 mil change (column 5)	17
Line number of message (column 10)	2
Cross wind (column 12)	.3
Weight of projectile (column 15)	+11
Old *VE* (column 16)	+2.0
Powder temperature (column 16)	+2.0
Air temperature (column 17)	+1.6
Range wind m. p. h. (column 18)	+5.3
Density (column 19)	−17

c. Weather-correction diagram.—(1) When weather corrections are to be determined for a number of concentrations, which is usually the case, a weather-correction diagram, similar to the one shown, may be constructed on the firing chart, or on tracing paper to cover the target area on the firing chart, the diagram being large enough to cover the concentrations for which data are to be corrected. Corrections for weight of projectile, *VE*, and weather are then determined for the target area at every 2000 yards of range and for every 200 or 400 mils of deflection. Corrections for specific targets are obtained from the diagram by inspection and interpolation. A diagram is constructed

upon the receipt of each metro message; basic data, for concentrations previously assigned, may then be readily corrected. Basic data for



each target and check point include drift correction, angle of site, and complementary angle of site.

(2) *Type problem.*—The following data are available to the battery commander:

Ammunition	Shell Mk. I, normal charge, fuze M46
Powder temperature	40° F.
Weight of projectile	3 crosses
Altitude of battery	1025 feet
VE from previous firing	minus 10 f/s
Y-azimuth of right limit of sector	2040
Y-azimuth of left limit of sector	1600
Range to nearest targets	3200 yards
Range to most distant targets	4900 yards

Metro message:

	MIF	MIF	
	3	12	45
0	25	18	99
1	27	20	98
2	27	22	98
3	29	25	97

Using the right-hand part of the Data Correction Sheet, deflection and range corrections are determined for range 3000 and 5000 and *Y*-azimuths 1600 and 2000. Appendix II shows the method by which the corrections were determined for *Y*-azimuth 2000 and range 3000. Corrections for the three other intersections are determined similarly. The corrections for targets 3, 4, 5, and 6 are then determined by inspection. The corrections are as follows:

Target No.	*Deflection*	*Range*
3	R8	+10 mils
4	R5	+6
5	R4 or 5	+8 or 9
6	R5	+11

8. Selection of appropriate charge.—The selection of the appropriate propelling charge for use with the 155-mm howitzer depends upon the range. While the same range often can be reached by more than one charge, it should be remembered—

a. The heavier the charge, the greater the erosion of the bore.

b. The lighter the charge, the greater the dispersion and the angle of impact.

c. When the range is greater than ¾ the maximum range of the charge tentatively selected, use the charge next above. Thus, for range 8100, use charge 6 instead of charge 5. Although increased erosion will result, not only will the dispersion be less, but it will not be necessary to change charges if the range is to be increased. This is particularly applicable where transfers of fire are to be made; the charge selected should be the one which will reach that concentration which is at the greatest range.

SECTION II

TABLES COMMON TO ALL WEAPONS

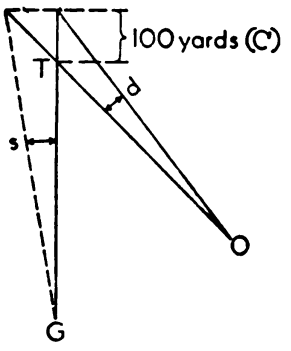
CONVERSION TABLES

1 yard____ = 0.9144 meters
1 meter___ = 1.0936 yards
1°_______ = 17.7778 mils
1′_______ = 0.2963 mils
1 mil_____ = 0.0563°
1 mil_____ = 3.375′

NATURAL FUNCTIONS OF ANGLES IN MILS

Mils	sin	cos	tan	cot		Mils	sin	cos	tan	cot	
0	.0000	1.0000	.0000		1600	400	.3827	.9239	.4142	2.414	1200
10	.0098	1.0000	.0098	101.8	90	10	.3917	.9200	.4258	2.349	90
20	.0197	.9998	.0197	50.92	80	20	.4007	.9162	.4374	2.286	80
30	.0295	.9996	.0295	33.95	70	30	.4097	.9122	.4492	2.226	70
40	.0393	.9992	.0393	25.45	60	40	.4187	.9081	.4610	2.169	60
50	.0491	.9988	.0491	20.36	50	50	.4276	.9040	.4730	2.114	50
60	.0589	.9983	.0590	16.96	40	60	.4364	.8998	.4851	2.062	40
70	.0687	.9976	.0688	14.53	30	70	.4453	.8954	.4972	2.011	30
80	.0785	.9969	.0787	12.71	20	80	.4540	.8910	.5095	1.963	20
90	.0883	.9961	.0887	11.29	10	90	.4627	.8865	.5217	1.916	10
100	.0980	.9952	.0985	10.15	1500	500	.4714	.8819	.5345	1.871	1100
10	.1078	.9942	.1084	9.224	90	10	.4801	.8773	.5472	1.827	90
20	.1175	.9931	.1184	8.449	80	20	.4886	.8725	.5600	1.786	80
30	.1272	.9919	.1284	7.793	70	30	.4972	.8677	.5731	1.745	70
40	.1371	.9906	.1384	7.230	60	40	.5057	.8628	.5861	1.706	60
50	.1467	.9892	.1484	6.741	50	50	.5141	.8577	.5994	1.668	50
60	.1564	.9877	.1584	6.314	40	60	.5225	.8526	.6128	1.632	40
70	.1661	.9861	.1684	5.936	30	70	.5309	.8474	.6264	1.596	30
80	.1758	.9845	.1784	5.600	20	80	.5392	.8422	.6401	1.561	20
90	.1855	.9827	.1887	5.299	10	90	.5474	.8369	.6541	1.529	10
200	.1951	.9808	.1989	5.027	1400	600	.5556	.8315	.6682	1.497	1000
10	.2048	.9788	.2092	4.782	90	10	.5638	.8259	.6825	1.465	90
20	.2144	.9768	.2195	4.558	80	20	.5718	.8204	.6970	1.435	80
30	.2239	.9746	.2297	4.353	70	30	.5798	.8148	.7116	1.405	70
40	.2334	.9724	.2401	4.165	60	40	.5878	.8090	.7265	1.376	60
50	.2430	.9700	.2505	3.992	50	50	.5957	.8032	.7416	1.348	50
60	.2525	.9676	.2610	3.832	40	60	.6036	.7973	.7570	1.320	40
70	.2620	.9651	.2715	3.684	30	70	.6114	.7914	.7725	1.294	30
80	.2714	.9625	.2820	3.546	20	80	.6191	.7853	.7883	1.268	20
90	.2809	.9597	.2926	3.417	10	90	.6268	.7792	.8044	1.243	10
300	.2903	.9569	.3033	3.297	1300	700	.6344	.7730	.8207	1.219	900
10	.2997	.9541	.3141	3.184	90	10	.6419	.7668	.8372	1.194	90
20	.3090	.9511	.3249	3.078	80	20	.6494	.7604	.8541	1.171	80
30	.3183	.9480	.3358	2.978	70	30	.6569	.7539	.8712	1.148	70
40	.3276	.9448	.3468	2.884	60	40	.6643	.7475	.8886	1.125	60
50	.3369	.9415	.3578	2.795	50	50	.6716	.7410	.9063	1.103	50
60	.3461	.9382	.3689	2.711	40	60	.6788	.7343	.9244	1.082	40
70	.3553	.9347	.3801	2.631	30	70	.6860	.7276	.9428	1.061	30
80	.3645	.9313	.3914	2.555	20	80	.6931	.7209	.9615	1.040	20
90	.3736	.9276	.4028	2.483	10	90	.7002	.7141	.9805	1.020	10
400	.3827	.9239	.4142	2.414	1200	800	.7071	.7071	1.0000	1.000	800
	cos	sin	cot	tan	Mils		cos	sin	cot	tan	Mils

EXPLANATION OF *s* AND *d* TABLES



G is the position of the piece.
O is the position of the observer.
T is the target, also the observer displacement (target offset in mils).
R is range *GT* in thousands of yards.
r is the distance *OT* in thousands of yards.
d is the deviation, as seen from *O*, corresponding to a range change of 100 yards (an increase in elevation of one *c*). Its value depends on the values of *T* and *r*.
s is the deflection shift necessary to keep a shot on the *OT* line when making a range change of 100 yards (an increase in elevation of one *c*).

s TABLE

Range *GT* in yards	*T* in mils														
	100	200	300	400	500	600	700	800	900	1000	1100	1150	1200	1250	1300
2000	5	10	15	21	27	34	42	51	62	76	95	108	123	142	168
2100	5	10	15	20	26	32	40	49	59	73	91	103	117	136	160
2200	5	9	14	19	25	31	38	46	56	69	87	98	112	129	153
2300	4	9	13	18	24	30	36	44	54	66	83	94	107	124	146
2400	4	8	13	18	23	28	35	42	52	64	79	90	102	119	140
2500	4	8	12	17	22	27	33	41	50	61	76	86	98	114	134
2600	4	8	12	16	21	26	32	39	48	59	73	83	95	109	129
2700	4	8	11	16	20	25	31	38	46	56	71	80	91	105	124
2800	4	7	11	15	19	24	30	36	44	54	68	77	88	102	120
2900	3	7	11	15	19	23	29	35	43	53	66	74	85	98	116
3000	3	7	10	14	18	23	28	34	41	51	64	72	82	95	112
3200	3	6	10	13	17	21	26	32	39	48	60	67	77	89	105
3400	3	6	9	12	16	20	25	30	37	45	56	63	72	84	99
3600	3	6	9	12	15	19	23	28	34	42	53	60	68	79	93
3800	3	5	8	11	14	18	22	27	33	40	50	57	65	75	88
4000	3	5	8	11	14	17	21	25	31	38	48	54	61	71	84
4500	2	5	7	9	12	15	19	23	28	34	42	48	55	63	75
5000	2	4	6	8	11	14	17	20	25	31	38	43	49	57	67
5500	2	4	6	8	10	12	15	19	23	28	35	39	45	52	61
6000	2	3	5	7	9	11	14	17	21	25	32	36	41	47	56
6500	2	3	5	6	8	10	13	16	19	23	29	33	38	44	52
7000	1	3	4	6	8	10	12	15	18	22	27	31	35	41	48
7500	1	3	4	6	7	9	11	14	17	20	25	29	33	38	45
8000	1	3	4	5	7	9	10	13	16	19	24	27	31	36	42
8500	1	2	4	5	6	8	10	12	15	18	22	25	29	33	40
9000	1	2	3	5	6	8	9	11	14	17	21	24	27	32	37
9500	1	2	3	4	6	7	9	11	13	16	20	23	26	30	35
10000	1	2	3	4	5	7	8	10	12	15	19	22	25	28	34

d TABLE

Distance *OT* in yards	*T* in mils												
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
1000	10	20	30	39	48	57	65	72	79	85	90	94	97
1100	9	18	27	35	44	51	59	65	72	77	82	86	89
1200	8	17	25	32	40	47	54	60	66	71	75	78	81
1300	8	15	23	30	37	44	50	55	61	65	69	72	75
1400	7	14	21	28	34	40	46	51	56	60	64	67	70
1500	7	13	20	26	32	38	43	48	52	56	60	63	65
1600	6	12	18	24	30	35	40	45	49	53	56	59	61
1700	6	12	17	23	28	33	38	42	46	50	53	55	57
1800	6	11	16	22	27	31	36	40	44	47	50	52	54
1900	5	10	16	21	25	30	34	38	41	45	47	50	51
2000	5	10	15	20	24	28	32	36	39	42	45	47	49
2100	5	9	14	19	23	27	31	34	37	40	43	45	46
2200	5	9	13	18	22	26	29	33	36	38	41	43	44
2300	4	9	13	17	21	25	28	31	34	37	39	41	42
2400	4	8	12	16	20	24	27	30	33	35	37	39	41
2500	4	8	12	16	19	23	26	29	31	34	36	38	39
2600	4	8	11	15	18	22	25	28	30	33	35	36	37
2700	4	7	11	14	18	21	24	27	29	31	33	35	36
2800	4	7	11	14	17	20	23	26	28	30	32	34	35
2900	3	7	10	13	17	20	22	25	27	29	31	32	34
3000	3	7	10	13	16	19	22	24	26	28	30	31	32
3200	3	6	9	12	15	18	20	23	25	26	28	29	30
3400	3	6	9	11	14	17	19	21	23	25	26	28	29
3600	3	6	8	11	13	16	18	20	22	24	25	26	27
3800	3	5	8	10	13	15	17	19	21	22	24	25	26
4000	2	5	7	10	12	14	16	18	20	21	22	24	24
4500	2	4	7	9	11	13	14	16	18	19	20	21	22
5000	2	4	6	8	10	11	13	14	16	17	18	19	19
5500	2	4	5	7	9	10	12	13	14	15	16	17	18
6000	2	3	5	6	8	9	11	12	13	14	15	16	16
6500	2	3	5	6	7	9	10	11	12	13	14	14	15
7000	1	3	4	6	7	8	9	10	11	12	13	13	14
7500	1	3	4	5	6	8	9	10	11	11	12	13	13
8000	1	2	4	5	6	7	8	9	10	11	11	12	12

ABBREVIATED FIRING TABLES

WIND COMPONENTS FOR 1 MILE-PER-HOUR WIND

Chart direction of wind	Cross wind m. p. h.	Range wind m. p. h.	Chart direction of wind	Cross wind m. p. h.	Range wind m. p. h.
0	**0**	**−1.00**	**3200**	**0**	**+1.00**
100	L .10	−.99	3300	R .10	+.99
200	L .20	−.98	3400	R .20	+.98
300	L .29	−.96	3500	R .29	+.96
400	L .38	−.92	3600	R .38	+.92
500	L .47	−.88	3700	R .47	+.88
600	L .56	−.83	3800	R .56	+.83
700	L .63	−.77	3900	R .63	+.77
800	L .71	−.71	4000	R .71	+.71
900	L .77	−.63	4100	R .77	+.63
1000	L .83	−.56	4200	R .83	+.56
1100	L .88	−.47	4300	R .88	+.47
1200	L .92	−.38	4400	R .92	+.38
1300	L .96	−.29	4500	R .96	+.29
1400	L .98	−.20	4600	R .98	+.20
1500	L .99	−.10	4700	R .99	+.10
1600	**L 1.00**	**.00**	**4800**	**R 1.00**	**.00**
1700	L .99	+.10	4900	R .99	−.10
1800	L .98	+.20	5000	R .98	−.20
1900	L .96	+.29	5100	R .96	−.29
2000	L .92	+.38	5200	R .92	−.38
2100	L .88	+.47	5300	R .88	−.47
2200	L .83	+.56	5400	R .83	−.56
2300	L .77	+.63	5500	R .77	−.63
2400	L .71	+.71	5600	R .71	−.71
2500	L .63	+.77	5700	R .63	−.77
2600	L .56	+.83	5800	R .56	−.83
2700	L .47	+.88	5900	R .47	−.88
2800	L .38	+.92	6000	R .38	−.92
2900	L .29	+.96	6100	R .29	−.96
3000	L .20	+.98	6200	R .20	−.98
3100	L .10	+.99	6300	R .10	−.99
3200	**0**	**+1.00**	**6400**	**0**	**−1.00**

This table divides a wind of 1 mile per hour, blowing from the chart direction, into two components: the cross wind, perpendicular to the plane of fire, and the range wind, parallel to the plane of fire. The chart direction is the *Y*-azimuth of the wind direction as given in the metro message (increased by 6400 when necessary) minus the *Y*-azimuth of the direction of fire.

273090°—40——2

CORRECTED DENSITY AND TEMPERATURE

Height of battery with reference to the MDP, ft.	Change in	
	Density in percent	Temperature in °F.
+600	−1. 8	−1. 2
+500	−1. 5	−1. 0
+400	−1. 2	−0. 8
+300	−0. 9	−0. 6
+200	−0. 6	−0. 4
+100	−0. 3	−0. 2
Same	0	0
−100	+0. 3	+0. 2
−200	+0. 6	+0. 4
−300	+0. 9	+0. 6
−400	+1. 2	+0. 8
−500	+1. 5	+1. 0
−600	+1. 8	+1. 2

` Density decreases 0.3 percent for each 100 feet battery is above the MDP. Temperature decreases 0.2° F. for each 100 feet battery is above the MDP.

Section III

FIRING TABLES, 75-MM GUN

Characteristics 75-mm Gun, M1897, M1897A1, M1897A2, M1897A3, and M1897A4 Firing Shrapnel Mk. I and HE Shell Mk. I

75-MM GUN

Diameter of the bore between lands	inches	2.953
Diameter of the bore between grooves	inches	2.992
Total length	inches	107.126
Length of rifled portion	inches	87.772
Travel of projectile	inches	89.9
Capacity of powder chamber	cubic inches	83
Number of grooves		24
Character of rifling		uniform twist, 1 in 25.6 calibers
Maximum pressure for which gun is designed	lb./sq. in.	36,000
Weight of gun and breech mechanism	pounds	1,035

ABBREVIATED FIRING TABLES

75-MM GUN CARRIAGE, M2

	On wheels	On firing jack
Maximum traverse, right——mils	800	800
Maximum traverse, left——mils	711	711
Least possible elevation——mils	−178	−178
Greatest possible elevation——mils	818	821
Traverse for one turn of the traversing handwheel——mils	19.0	19.0
Change in elevation for one turn of elevating handwheel——mils	10	10
Maximum range scale setting——yards	9760	9760

75-MM GUN CARRIAGE, M1897 (AND MODIFICATIONS)

Total traverse (one-half on each side)——mils	106
Least possible elevation——mils	−178
Greatest possible elevation——mils	338
Traverse for one turn of traversing handwheel——mils	1.8
Change in elevation for one turn of elevating handwheel——mils	8
Maximum range scale setting——meters	5500

PROJECTILE—MEAN WEIGHT OF FUZED PROJECTILE IN POUNDS

Shrapnel.—Standardized at 15.96 pounds.

HE Shell, Mk. I.—P. D. fuzes M46 and M47.

Variations in weight are indicated by markings stenciled on the projectile as follows:

Marking	*Weight*
L	11.58
+	11.91
+ + (standard)	12.24
+ + +	12.57
+ + + +	12.90

FUZES

21–second combination time and percussion.

Point detonating fuzes:

M46 (nose painted white)——superquick.

M47 (nose painted black)——delay.

COMBINATIONS OF PROJECTILE, CHARGE, AND FUZE FOR WHICH TABLES ARE NOT INCLUDED HEREIN

HE shell Mk. I, fuzes M46 and M47, reduced charge: Muzzle velocity 1115 f/s; maximum range, 6775 yards.

HE shell Mk. I, fuzes (short) Mk. IV and Mk. V, reduced charge: Muzzle velocity, 1130 f/s; maximum range, 6965 yards.

HE shell Mk. I, fuzes (short) Mk. IV and Mk. V, normal charge: Muzzle velocity, 1805 f/s; maximum range, 8915 yards.

HE shell Mk. I, fuze (long) Mk. III, normal charge: Muzzle velocity, 1778 f/s; maximum range, 8175 yards.

Chemical shell Mk. II, fuzes M46 and M47, reduced charge: Muzzle velocity, 1115 f/s; maximum range, 6425 yards.

Chemical shell Mk. II, fuzes M46 and M47, normal charge: Muzzle velocity, 1758 f/s; maximum range, 8810 yards.

Chemical shell Mk. II, fuzes (short) Mk. IV and Mk. V, reduced charge: Muzzle velocity, 1130 f/s; maximum range, 6400 yards.

Chemical shell Mk. II, fuzes (short) Mk. IV and Mk. V, normal charge: Muzzle velocity, 1805 f/s; maximum range, 8400 yards.

Chemical shell Mk. II, fuze (long) Mk. III, normal charge: Muzzle velocity, 1778 f/s; maximum range, 7925 yards.

SHRAPNEL, MK. I

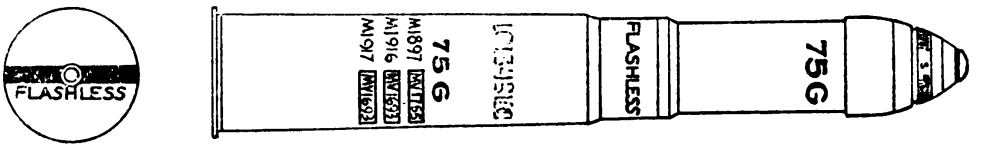
Fuze, 21-second combination

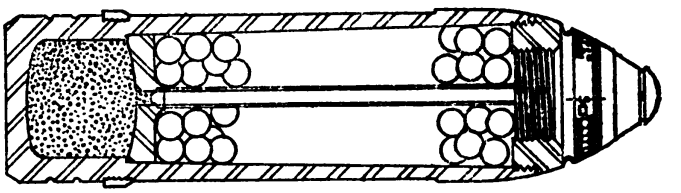
(MV 1755 f/s)

NOTE.—Elevations given in this table are for carriage M2. Add 0.8 mils to these elevations when firing from carriage M1897 (and modifications).

Maximum range: 9760 yards.

Data for ranges 0—8000 included herein.





ABBREVIATED FIRING TABLES

TABLE A

1	2	3	4	5	6	7	8	9	10	11	12	13
						Probable error					Deflection effect	
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Height of burst	Slope of fall	Line number of metro message	Drift*	Lateral wind of 1 mile per hour(+)
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}		Slope	Line	Dft.	W–D
yds.	mils	mils	mils	yds.	sec.	yds.	yds.	mils	1/-	No.	mils	mils
0	0. 2	1	1. 6	67	0. 0	11	0	1		1	L 1	. 0
100	1. 8	1	1. 6	64	0. 1	11	0	1	1018	1	L 1	. 0
200	3. 4	1	1. 6	61	0. 3	11	0	1	407	1	L 1	. 0
300	5. 0	1	1. 8	58	0. 5	11	0	1	255	1	0	. 1
400	6. 8	1	1. 8	56	0. 7	11	0	1	173	1	0	. 1
500	8. 6	1	1. 8	54	0. 9	11	0	1	124	1	0	. 1
600	10. 6	1	2. 0	52	1. 1	11	0	1	95	1	0	. 1
700	12. 6	1	2. 0	50	1. 3	11	0	1	77	1	0	. 1
800	14. 6	1	2. 0	48	1. 5	11	0	1	64	1	0	. 1
900	16. 8	1	2. 2	47	1. 7	11	0	1	54	1	0	. 1
1000	19. 0	1	2. 2	45	1. 9	11	1	1	46	1	0	. 1
1100	21. 2	1	2. 2	44	2. 1	11	1	1	40	1	0	. 1
1200	23. 6	1	2. 4	42	2. 3	11	1	1	35	1	0	. 1
1300	26. 2	1	2. 4	41	2. 6	11	1	1	31	1	0	. 2
1400	28. 8	1	2. 4	40	2. 8	11	1	1	28	1	R 1	. 2
1500	31. 4	1	2. 6	38	3. 0	11	1	1	25	1	R 1	. 2
1600	34. 0	1	2. 6	37	3. 2	11	1	1	23	1	R 1	. 2
1700	36. 8	1	2. 6	36	3. 4	11	1	1	21	1	R 1	. 2
1800	39. 6	1	2. 8	35	3. 7	11	1	1	19. 7	1	R 1	. 2
1900	42. 6	1	2. 8	34	4. 0	11	1	1	18. 2	1	R 1	. 2
2000	45. 6	1	3. 0	33	4. 3	11	1	1	16. 8	1	R 1	. 2
2100	48. 6	1	3. 0	32	4. 6	11	1	1	15. 6	1	R 1	. 2
2200	51. 6	1	3. 2	32	4. 9	11	1	1	14. 5	1	R 1	. 2
2300	54. 8	1	3. 2	31	5. 1	11	1	1	13. 5	1	R 1	. 3
2400	58. 2	1	3. 4	30	5. 4	11	1	1	12. 6	1	R 1	. 3
2500	61. 8	1	3. 4	29	5. 7	11	1	1	11. 8	1	R 1	. 3
2600	65. 4	2	3. 4	29	6. 0	11	1	1	11. 2	1	R 2	. 3
2700	69. 0	2	3. 6	28	6. 3	11	1	1	10. 6	1	R 2	. 3
2800	72. 6	2	3. 6	27	6. 5	11	1	1	10. 0	1	R 2	. 3
2900	76. 2	2	3. 6	27	6. 8	11	1	1	9. 4	1	R 2	. 3
3000	80. 0	2	3. 8	26	7. 1	11	1	1	8. 9	1	R 2	. 3
3100	83. 8	2	3. 8	26	7. 4	11	1	1	8. 4	1	R 2	. 3
3200	87. 6	2	4. 0	25	7. 7	11	1	1	8. 0	1	R 2	. 3
3300	91. 6	2	4. 0	25	8. 0	11	1	1	7. 6	1	R 3	. 4
3400	95. 8	2	4. 2	24	8. 3	11	1	1	7. 2	1	R 3	. 4
3500	100. 0	2	4. 2	24	8. 6	11	1	1	6. 9	1	R 3	. 4
3600	104. 2	2	4. 2	23	8. 9	11	1	1	6. 6	1	R 3	. 4
3700	108. 6	2	4. 4	23	9. 2	11	1	1	6. 3	1	R 3	. 4
3800	113. 0	2	4. 4	23	9. 5	11	1	1	6. 0	1	R 3	. 4
3900	117. 4	2	4. 4	22	9. 9	11	1	1	5. 8	1	R 3	. 4
4000	122. 0	2	4. 6	22	10. 2	11	1	1	5. 5	1	R 4	. 4

*Drift includes side jump.

273090°—40——3

14	15	16	17	18	19	20	21	22	23	24	25	1
Comp. angle of site for each		Range effect of increase of—										
+1 mil of site	−1 mil of site	One percent in wt. of projectile. Std. wt. 15.96 lbs.	One foot per second in MV	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Fuze setting for graze burst	Displacement of burst for change of 5 points in fuze setter corrector in—		Range setting for 1897 carriage (and models)	Range setting for M2 carriage	Range
		Wt.	VE	Temp.	W-R	Den.	F.S.	Height	Range	Set.	Set.	R
m	m	yds.	yds.	yds.	yds.	yds.	sec.	m	yds.	m.	yds.	yds.
.00	.00	0	0.0	0.0	0.0	0	0.0			160	−50	0
.00	.00	−1	+0.1	0.0	0.0	0	0.2	4.1	230	250	+50	100
.00	.00	−1	+0.2	0.0	+0.1	0	0.4	4.1	226	340	150	200
.00	.00	−2	+0.3	0.0	+0.1	0	0.6	4.2	221	425	250	300
.00	.00	−2	+0.4	0.0	+0.1	0	0.8	4.2	217	510	355	400
.00	.00	−3	+0.5	0.0	+0.2	−1	1.0	4.3	213	595	455	500
.00	.00	−3	+0.6	0.0	+0.2	−1	1.2	4.4	209	680	555	600
.00	.00	−4	+0.7	0.0	+0.2	−1	1.4	4.5	205	765	655	700
.00	.00	−4	+0.8	0.0	+0.3	−1	1.6	4.5	202	850	755	800
.00	.00	−5	+0.9	0.0	+0.3	−2	1.9	4.6	199	935	855	900
.00	.00	−5	+1.0	0.0	+0.4	−2	2.1	4.7	196	1020	955	1000
.00	.00	−5	+1.1	0.0	+0.4	−2	2.3	4.7	193	1110	1060	1100
.00	.00	−5	+1.1	0.0	+0.5	−2	2.6	4.8	190	1200	1165	1200
.00	.00	−5	−1.2	0.0	+0.5	−3	2.8	4.9	188	1290	1270	1300
.00	.00	−5	+1.2	0.0	+0.6	−3	3.1	4.9	185	1380	1375	1400
.00	.00	−5	+1.3	0.0	+0.7	−3	3.3	5.0	183	1470	1480	1500
.00	.00	−5	+1.3	0.0	+0.7	−4	3.6	5.1	180	1560	1580	1600
.00	.00	−5	+1.4	0.0	+0.8	−4	3.8	5.1	178	1650	1680	1700
.00	.00	−5	+1.5	0.0	+0.9	−5	4.1	5.2	176	1745	1780	1800
.00	.00	−5	+1.5	+0.1	+1.0	−5	4.3	5.3	174	1840	1880	1900
+.01	−.01	−5	+1.6	+0.1	+1.1	−5	4.6	5.3	172	1935	1980	2000
+.01	−.01	−5	+1.6	+0.1	+1.2	−6	4.9	5.4	170	2030	2080	2100
+.01	−.01	−5	+1.7	+0.1	+1.3	−6	5.2	5.5	168	2125	2180	2200
+.01	−.01	−4	+1.7	+0.2	+1.4	−6	5.5	5.5	166	2220	2280	2300
+.01	−.01	−4	+1.8	+0.2	+1.5	−7	5.8	5.6	165	2315	2380	2400
+.01	−.01	−4	+1.8	+0.3	+1.6	−7	6.0	5.7	163	2415	2480	2500
+.01	−.01	−4	+1.9	+0.3	+1.7	−8	6.3	5.8	162	2515	2580	2600
+.01	−.01	−4	+1.9	+0.3	+1.8	−8	6.6	5.9	160	2615	2685	2700
+.01	−.01	−3	+2.0	+0.4	+1.9	−9	6.9	5.9	159	2715	2785	2800
+.01	−.01	−3	+2.0	+0.4	+2.0	−9	7.2	6.0	157	2810	2885	2900
+.01	−.01	−3	+2.0	+0.5	+2.2	−9	7.5	6.0	156	2905	2985	3000
+.01	−.01	−3	+2.1	+0.5	+2.3	−10	7.9	6.1	155	3000	3085	3100
+.01	−.01	−3	+2.1	+0.6	+2.4	−10	8.2	6.1	153	3095	3180	3200
+.01	−.01	−2	+2.1	+0.6	+2.6	−11	8.5	6.2	152	3195	3280	3300
+.01	−.01	−2	+2.2	+0.7	+2.7	−11	8.8	6.3	150	3290	3380	3400
+.01	−.01	−2	+2.2	+0.8	+2.9	−11	9.1	6.3	149	3385	3480	3500
+.01	−.01	−2	+2.2	+0.9	+3.0	−12	9.4	6.4	148	3480	3580	3600
+.01	−.01	−2	+2.3	+0.9	+3.2	−12	9.7	6.4	147	3580	3680	3700
+.01	−.01	−1	+2.3	+1.0	+3.3	−13	10.0	6.5	146	3675	3780	3800
+.01	−.01	−1	+2.3	+1.0	+3.5	−13	10.4	6.6	144	3770	3880	3900
+.01	−.01	−1	+2.3	+1.1	+3.7	−14	10.7	6.6	143	3865	3980	4000

1	2	3	4	5	6	7	8	9	10	11	12	13
						Probable error					Deflection effect	
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Height of burst	Slope of fall	Line number of metro message	Drift*	Lateral wind of 1 mile per hour (+)
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}		Slope	Line	Dft.	W–D
yds.	ṁ	ṁ	ṁ	yds.	sec.	yds.	yds.	ṁ	1/-	No.	ṁ	ṁ
4000	122. 0	2	4. 6	22	10. 2	11	1	1	5. 5	1	R 4	. 4
4100	126. 6	2	4. 6	21	10. 5	12	2	1	5. 3	1	R 4	. 4
4200	131. 4	2	4. 8	21	10. 9	12	2	1	5. 1	1	R 4	. 4
4300	136. 2	2	4. 8	21	11. 2	12	2	1	4. 9	1	R 4	. 5
4400	141. 0	2	4. 8	20	11. 6	12	2	1	4. 7	1	R 4	. 5
4500	146. 0	2	5. 0	20	11. 9	12	2	1	4. 5	2	R 4	. 5
4600	151. 0	3	5. 0	20	12. 3	12	2	1	4. 3	2	R 4	. 5
4700	156. 0	3	5. 0	19	12. 6	12	2	1	4. 2	2	R 4	. 5
4800	161. 2	3	5. 2	19	13. 0	12	2	1	4. 0	2	R 5	. 5
4900	166. 6	3	5. 2	19	13. 3	13	2	1	3. 9	2	R 5	. 5
5000	172. 0	3	5. 4	19	13. 7	13	3	1	3. 7	2	R 5	. 5
5100	177. 6	3	5. 4	18	14. 0	13	3	1	3. 6	2	R 5	. 5
5200	183. 2	3	5. 6	18	14. 4	13	3	1	3. 5	2	R 5	. 5
5300	188. 8	3	5. 6	18	14. 8	14	3	1	3. 4	2	R 6	. 6
5400	194. 4	3	5. 8	17	15. 2	14	3	1	3. 2	2	R 6	. 6
5500	200. 2	3	5. 8	17	15. 6	14	3	1	3. 1	2	R 6	. 6
5600	206. 2	3	6. 0	17	16. 0	14	3	1	3. 0	2	R 6	. 6
5700	212. 2	3	6. 0	16	16. 4	15	3	1	2. 9	2	R 6	. 6
5800	218. 4	4	6. 2	16	16. 9	15	3	1	2. 8	2	R 7	. 6
5900	224. 6	4	6. 2	16	17. 3	15	3	1	2. 8	2	R 7	. 6
6000	231. 0	4	6. 4	16	17. 7	16	3	1	2. 7	2	R 7	. 6
6100	237. 6	4	6. 4	15	18. 1	16	3	1	2. 6	2	R 7	. 6
6200	244. 2	4	6. 6	15	18. 6	17	3	1	2. 5	2	R 7	. 6
6300	251. 0	5	6. 6	15	19. 0	17	3	2	2. 4	3	R 8	. 7
6400	257. 8	5	6. 8	15	19. 4	18	3	2	2. 4	3	R 8	. 7
6500	264. 6	5	7. 0	14	19. 9	18	3	2	2. 3	3	R 8	. 7
6600	271. 6	5	7. 0	14	20. 4	19	3	2	2. 2	3	R 9	. 7
6700	278. 8	6	7. 2	14	20. 8	19	3	2	2. 2	3	R 9	. 7
6800	286. 2	6	7. 4	14	21. 3	20	3		2. 1	3	R 9	. 7
6900	293. 8	6	7. 6	13	21. 8	20	3		2. 0	3	R 10	. 7
7000	301. 4	6	7. 6	13	22. 3	21	3		2. 0	3	R 10	. 7
7100	309. 2	6	7. 8	13	22. 8	22	4		1. 93	3	R 10	. 7
7200	317. 2	7	8. 0	13	23. 3	22	4		1. 87	3	R 11	. 7
7300	325. 4	7	8. 2	12	23. 8	23	4		1. 81	3	R 11	. 8
7400	333. 6	8	8. 2	12	24. 3	23	4		1. 76	3	R 12	. 8
7500	342. 0	8	8. 4	12	24. 9	24	4		1. 71	3	R 12	. 8
7600	350. 6	9	8. 6	12	25. 4	25	4		1. 66	3	R 12	. 8
7700	359. 4	9	8. 8	11	26. 0	26	4		1. 61	3	R 13	. 8
7800	368. 6	10	9. 0	11	26. 5	26	4		1. 57	3	R 13	. 8
7900	378. 0	10	9. 2	11	27. 1	27	4		1. 52	4	R 14	. 8
8000	387. 6	11	9. 6	10	27. 7	28	4		1. 47	4	R 14	. 8

* Drift includes side jump.

14	15	16	17	18	19	20	21	22	23	24	25	1
Comp. angle of site for each		Range effect of increase of—										
+1 mil of site	−1 mil of site	One percent in wt. of projectile. Std. wt. 15.96 lbs.	One foot per second in MV	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Fuze setting for graze burst	Displacement of burst for change of 5 points in fuze setter corrector in—		Range setting for 1897 carriage (and models)	Range setting for M2 carriage	Range
		Wt.	VE	Temp.	W–R	Den.	F.S.	Height	Range	Set.	Set.	R
m	m	yds.	yds.	yds.	yds.	yds.	sec.	m	yds.	m.	yds.	yds.
+. 01	−. 01	− 1	+2. 3	+1. 1	+ 3. 7	−14	10. 7	6. 6	143	3865	3980	4000
+. 01	−. 01	− 1	+2. 4	+1. 2	+ 3. 8	−14	11. 0	6. 7	142	3965	4080	4100
+. 01	−. 01	− 1	+2. 4	+1. 2	+ 4. 0	−15	11. 4	6. 7	140	4060	4185	4200
+. 02	−. 02	0	+2. 4	+1. 3	+ 4. 2	−15	11. 7	6. 8	139	4155	4285	4300
+. 02	−. 02	0	+2. 5	+1. 4	+ 4. 4	−15	12. 1	6. 9	138	4250	4385	4400
+. 02	−. 02	0	+2. 5	+1. 4	+ 4. 6	−16	12. 4	6. 9	137	4345	4485	4500
+. 02	−. 02	0	+2. 5	+1. 5	+ 4. 8	−16	12. 8	7. 0	136	4440	4585	4600
+. 02	−. 02	+ 1	+2. 5	+1. 6	+ 5. 0	−16	13. 1	7. 1	135	4535	4685	4700
+. 02	−. 02	+ 1	+2. 6	+1. 7	+ 5. 2	−17	13. 5	7. 1	134	4630	4785	4800
+. 02	−. 02	+ 1	+2. 6	+1. 7	+ 5. 4	−17	13. 8	7. 2	133	4725	4885	4900
+. 02	−. 02	+ 2	+2. 6	+1. 8	+ 5. 6	−18	14. 2	7. 2	132	4820	4985	5000
+. 02	−. 02	+ 2	+2. 6	+1. 9	+ 5. 8	−18	14. 5	7. 3	131	4915	5090	5100
+. 03	−. 03	+ 2	+2. 6	+1. 9	+ 6. 0	−19	14. 9	7. 3	130	5010	5190	5200
+. 03	−. 03	+ 2	+2. 6	+2. 0	+ 6. 2	−19	15. 2	7. 4	129	5100	5290	5300
+. 03	−. 03	+ 3	+2. 7	+2. 1	+ 6. 4	−20	15. 6	7. 4	128	5190	5390	5400
+. 03	−. 03	+ 3	+2. 7	+2. 2	+ 6. 7	−20	16. 0	7. 5	127	5280	5485	5500
+. 03	−. 03	+ 3	+2. 7	+2. 2	+ 6. 9	−21	16. 3	7. 5	126	5370	5585	5600
+. 03	−. 03	+ 4	+2. 7	+2. 3	+ 7. 1	−21	16. 7	7. 6	125	5460	5685	5700
+. 04	−. 04	+ 4	+2. 7	+2. 4	+ 7. 3	−22	17. 1	7. 7	125		5785	5800
+. 04	−. 04	+ 4	+2. 7	+2. 5	+ 7. 5	−22	17. 5	7. 7	124		5885	5900
+. 04	−. 04	+ 5	+2. 8	+2. 6	+ 7. 8	−23	17. 9	7. 8	123		5985	6000
+. 04	−. 04	+ 5	+2. 8	+2. 6	+ 8. 0	−23	18. 3	7. 8	122		6090	6100
+. 05	−. 05	+ 6	+2. 8	+2. 7	+ 8. 2	−24	18. 7	7. 9	121		6190	6200
+. 05	−. 05	+ 6	+2. 8	+2. 8	+ 8. 4	−24	19. 1	8. 0	121		6290	6300
+. 06	−. 06	+ 7	+2. 8	+2. 9	+ 8. 7	−25	19. 5	8. 0	120		6390	6400
+. 06	−. 06	+ 7	+2. 8	+3. 0	+ 8. 9	−25	20. 0	8. 1	119		6490	6500
+. 07	−. 07	+ 7	+2. 9	+3. 0	+ 9. 2	−26	20. 5	8. 1	118		6590	6600
+. 07	−. 07	+ 8	+2. 9	+3. 1	+ 9. 4	−26	21. 0	8. 2	117		6690	6700
+. 08	−. 08	+ 8	+2. 9	+3. 2	+ 9. 6	−27					6790	6800
+. 08	−. 08	+ 9	+2. 9	+3. 3	+ 9. 8	−27					6890	6900
+. 09	−. 09	+ 9	+2. 9	+3. 4	+10. 1	−28					6990	7000
+. 10	−. 10	+ 9	+3. 0	+3. 5	+10. 3	−28					7090	7100
+. 11	−. 11	+10	+3. 0	+3. 5	+10. 6	−29					7190	7200
+. 12	−. 11	+10	+3. 0	+3. 6	+10. 8	−29					7290	7300
+. 13	−. 12	+11	+3. 0	+3. 7	+11. 0	−30					7390	7400
+. 14	−. 13	+11	+3. 0	+3. 8	+11. 3	−30					7490	7500
+. 16	−. 14	+11	+3. 0	+3. 9	+11. 5	−31					7590	7600
+. 17	−. 15	+12	+3. 0	+4. 0	+11. 7	−31					7690	7700
+. 19	−. 17	+12	+3. 0	+4. 0	+12. 0	−32					7790	7800
+. 20	−. 18	+13	+3. 1	+4. 1	+12. 2	−32					7890	7900
+. 22	−. 19	+13	+3. 1	+4. 2	+12. 5	−33					7990	8000

NOTE.—Since the shrapnel is armed with a 21-second combination fuze, all information which is based on the behavior of this fuze is not given beyond the point where the fuze setting for graze burst is 21 seconds.

Quadrant aiming

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second	−51	−44	−37	−29	−22	−15	−8	0	+8	+16	+25

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	5000	6000	7000
Cant of 10 mils, effect	0. 2	0. 4	0. 8	1. 2	1. 7	2. 3	3. 0
Range, yards	7000	8000	9000	9500	9600	9700	9760
Cant of 10 mils, effect	3. 0	4. 0	5. 4	6. 8	7. 3	8. 0	9. 5

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

ABBREVIATED FIRING TABLES

HE SHELL, MK. I

Fuzes M46 and M47 (normal charge)
(MV 1784 f/s)

NOTE.—Elevations given in this table are for Carriage M2. Add 0.8 mil to these elevations when firing from Carriage M1897 (and modifications).

Maximum range: 9000 yards.

(Data for ranges 0–8000 included herein)

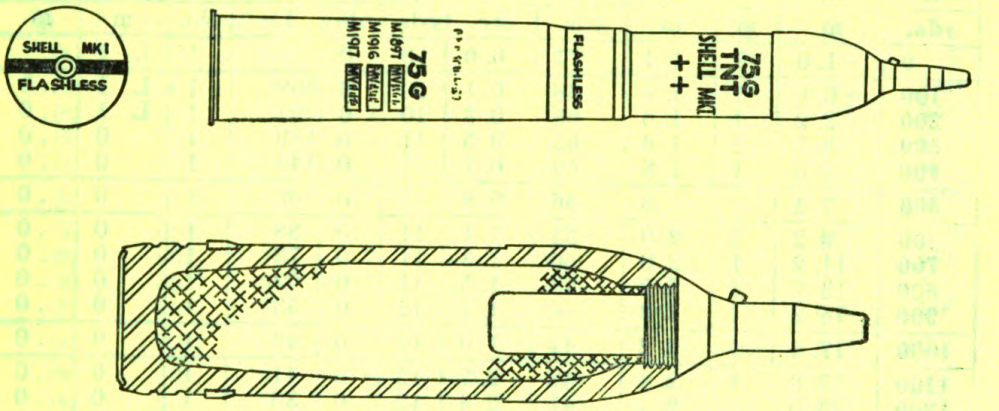


TABLE A

1	2	3	4	5	6	7	8	9	10	11	12
						Probable error				Deflection effect	
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Slope of fall	Line number of metro message	Drift*	Lateral wind of 1 mile per hour(+)
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}	Slope	Line	Dft.	W-D
yds.	mils	mils	mils	yds.	sec.	yds.	yds.	1/–	No.	mils	mils
0	−1.0	1	1.4	71	0.0	10	0		1	L 1	
100	+0.6	1	1.4	68	0.1	10	0	599	1	L 1	.0
200	2.2	1	1.6	65	0.3	10	0	291	1	L 1	.0
300	3.8	1	1.6	62	0.5	11	0	189	1	0	.0
400	5.6	1	1.8	59	0.7	11	0	140	1	0	.0
500	7.4	1	1.8	56	0.9	11	0	109	1	0	.0
600	9.2	1	2.0	53	1.1	11	0	88	1	0	.0
700	11.2	1	2.0	50	1.3	11	0	73	1	0	.0
800	13.2	1	2.2	48	1.5	11	0	62	1	0	.0
900	15.2	1	2.2	46	1.7	12	0	53	1	0	.0
1000	17.4	1	2.2	44	1.9	12	0	46	1	0	.0
1100	19.6	1	2.4	42	2.2	12	0	41	1	0	.0
1200	22.0	1	2.4	41	2.4	12	0	36	1	0	.0
1300	24.4	1	2.6	39	2.6	12	0	32	1	0	.0
1400	27.0	1	2.6	38	2.9	12	0	29	1	0	.0
1500	29.6	1	2.8	37	3.1	13	0	26	1	R 1	.1
1600	32.4	1	2.8	36	3.4	13	0	23	1	R 1	.1
1700	35.2	2	3.0	34	3.6	13	0	21	1	R 1	.1
1800	38.0	2	3.0	33	3.9	13	0	19.2	1	R 1	.1
1900	41.0	2	3.2	32	4.2	14	0	17.6	1	R 1	.1
2000	44.2	2	3.2	31	4.4	14	0	16.2	1	R 1	.1
2100	47.4	2	3.4	30	4.7	14	0	14.9	1	R 1	.1
2200	50.8	2	3.4	29	5.0	14	0	13.8	1	R 1	.1
2300	54.2	2	3.6	28	5.3	15	0	12.8	1	R 1	.1
2400	57.8	2	3.6	27	5.6	15	0	11.9	1	R 2	.1
2500	61.4	2	3.8	26	5.9	15	0	11.1	1	R 2	.1
2600	65.2	2	3.8	26	6.2	15	0	10.4	1	R 2	.1
2700	69.0	3	4.0	25	6.5	16	0	9.8	1	R 2	.2
2800	73.0	3	4.0	25	6.8	16	0	9.2	1	R 2	.2
2900	77.0	3	4.2	24	7.1	16	0	8.6	1	R 2	.2
3000	81.2	3	4.2	24	7.4	17	0	8.1	1	R 2	.2
3100	85.4	3	4.4	23	7.7	17	0	7.7	1	R 2	.2
3200	89.8	3	4.4	23	8.1	17	0	7.3	1	R 3	.2
3300	94.4	3	4.6	22	8.4	18	0	6.9	1	R 3	.2
3400	99.0	3	4.6	22	8.7	18	0	6.6	1	R 3	.2
3500	103.6	3	4.8	21	9.1	18	0	6.3	1	R 3	.2
3600	108.4	4	4.8	21	9.4	19	0	6.0	1	R 3	.2
3700	113.4	4	5.0	20	9.8	19	0	5.7	1	R 3	.2
3800	118.4	4	5.0	20	10.1	20	0	5.4	1	R 3	.3
3900	123.4	4	5.2	19	10.5	20	0	5.2	1	R 4	.3
4000	128.6	4	5.2	19	10.8	21	0	5.0	1	R 4	.3

*Drift includes side jump.

13	14	15	16	17	18	19	20	21	1
Complementary angle of site for each		Range Effect of Increase of—							
+1 mil of site	−1 mil of site	One + in weight of projectiles. Two ++ is standard	One foot per second in MV	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Range setting for 1897 carriage (and models)	Range setting for M2 carriage	Range
		Wt.	VE	Temp.	W-R	Den.	Set.	Set.	R
m/m	m/m	yds.	yds.	yds.	yds.	yds.	m.	yds.	yds.
.00	.00	0	0.0	0.0	0.0	0	85	−135	**0**
.00	.00	−1	+0.1	0.0	0.0	0	170	−30	**100**
.00	.00	−2	+0.2	0.0	0.0	0	270	+75	**200**
.00	.00	−4	+0.3	0.0	0.0	−1	360	170	**300**
.00	.00	−5	+0.4	0.0	0.0	−1	445	270	**400**
.00	.00	−6	+0.5	0.0	0.0	−1	530	380	**500**
.00	.00	−7	+0.6	0.0	+0.1	−2	615	490	**600**
.00	.00	−7	+0.7	0.0	+0.1	−2	700	600	**700**
.00	.00	−8	+0.7	+0.1	+0.1	−2	785	700	**800**
.00	.00	−8	+0.8	+0.1	+0.2	−2	870	800	**900**
.00	.00	−8	+0.9	+0.1	+0.2	−3	960	900	**1000**
.00	.00	−9	+0.9	+0.1	+0.3	−3	1050	1000	**1100**
.00	.00	−9	+1.0	+0.1	+0.3	−3	1140	1100	**1200**
.00	.00	−9	+1.1	+0.2	+0.4	−3	1230	1205	**1300**
.00	.00	−9	+1.1	+0.2	+0.4	−4	1320	1305	**1400**
.00	.00	−10	+1.2	+0.2	+0.5	−4	1410	1410	**1500**
.00	.00	−10	+1.3	+0.2	+0.5	−4	1510	1520	**1600**
.00	.00	−10	+1.3	+0.2	+0.6	−5	1605	1625	**1700**
+.01	−.01	−10	+1.4	+0.3	+0.7	−5	1700	1725	**1800**
+.01	−.01	−10	+1.5	+0.3	+0.8	−6	1800	1830	**1900**
+.01	−.01	−10	+1.5	+0.3	+0.9	−6	1900	1935	**2000**
+.01	−.01	−9	+1.6	+0.3	+1.0	−6	2000	2040	**2100**
+.01	−.01	−9	+1.6	+0.4	+1.1	−7	2105	2145	**2200**
+.01	−.01	−9	+1.6	+0.4	+1.2	−7	2205	2250	**2300**
+.01	−.01	−8	+1.7	+0.4	+1.3	−8	2305	2360	**2400**
+.01	−.01	−8	+1.7	+0.5	+1.5	−8	2410	2470	**2500**
+.01	−.01	−7	+1.7	+0.5	+1.6	−8	2515	2575	**2600**
+.01	−.01	−7	+1.7	+0.6	+1.8	−9	2615	2685	**2700**
+.02	−.02	−6	+1.8	+0.6	+1.9	−9	2720	2795	**2800**
+.02	−.02	−5	+1.8	+0.7	+2.1	−10	2825	2905	**2900**
+.02	−.02	−4	+1.8	+0.7	+2.3	−10	2930	3015	**3000**
+.02	−.02	−3	+1.8	+0.8	+2.5	−10	3035	3120	**3100**
+.02	−.02	−2	+1.8	+0.8	+2.7	−11	3140	3230	**3200**
+.02	−.02	−1	+1.9	+0.9	+2.8	−11	3250	3345	**3300**
+.02	−.02	0	+1.9	+0.9	+3.0	−12	3360	3460	**3400**
+.02	−.02	0	+1.9	+1.0	+3.2	−12	3470	3570	**3500**
+.02	−.02	+1	+1.9	+1.0	+3.4	−13	3580	3680	**3600**
+.03	−.03	+2	+1.9	+1.1	+3.6	−13	3685	3790	**3700**
+.03	−.03	+3	+1.9	+1.1	+3.7	−14	3790	3900	**3800**
+.03	−.03	+4	+1.9	+1.2	+3.9	−14	3895	4015	**3900**
+.03	−.03	+5	+2.0	+1.3	+4.1	−15	4000	4125	**4000**

1	2	3	4	5	6	7	8	9	10	11	12
						Probable error				Deflection effect	
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Slope of fall	Line number of metro message	Drift*	Lateral wind of 1 mile per hour(+)
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}	Slope	Line	Dft.	W-D
yds.	mils	mils	mils	yds.	sec.	yds.	yds.	1/–	No.	mils	mils
4000	128. 6	4	5. 2	19	10. 8	21	0	5. 0	1	R 4	. 3
4100	134. 0	5	5. 4	19	11. 2	21	0	4. 8	1	R 4	. 3
4200	139. 4	5	5. 4	18	11. 6	22	0	4. 6	1	R 4	. 3
4300	144. 8	5	5. 6	18	12. 0	22	0	4. 4	2	R 4	. 3
4400	150. 4	5	5. 8	18	12. 3	22	1	4. 2	2	R 4	. 3
4500	156. 2	5	5. 8	17	12. 7	23	1	4. 0	2	R 5	. 3
4600	162. 2	6	6. 0	17	13. 1	23	1	3. 9	2	R 5	. 3
4700	168. 2	6	6. 0	17	13. 5	24	1	3. 7	2	R 5	. 4
4800	174. 4	6	6. 2	16	13. 9	24	1	3. 6	2	R 5	. 4
4900	180. 6	6	6. 4	16	14. 3	25	1	3. 5	2	R 5	. 4
5000	187. 0	6	6. 4	16	14. 7	25	1	3. 3	2	R 6	. 4
5100	193. 4	7	6. 6	15	15. 1	26	1	3. 2	2	R 6	. 4
5200	200. 0	7	6. 6	15	15. 6	26	1	3. 1	2	R 6	. 4
5300	206. 8	7	6. 8	15	16. 0	27	1	3. 0	2	R 6	. 4
5400	213. 6	8	7. 0	14	16. 4	27	1	2. 9	2	R 7	. 4
5500	220. 6	8	7. 0	14	16. 9	28	1	2. 8	2	R 7	. 5
5600	227. 8	8	7. 2	14	17. 3	29	1	2. 7	2	R 7	. 5
5700	235. 0	9	7. 4	13	17. 7	29	1	2. 6	2	R 8	. 5
5800	242. 4	9	7. 6	13	18. 2	30	1	2. 5	2	R 8	. 5
5900	250. 0	9	7. 6	13	18. 7	30	1	2. 4	2	R 8	. 5
6000	257. 6	10	7. 8	13	19. 1	31	1	2. 3	3	R 9	. 5
6100	265. 6	10	8. 0	12	19. 6	32	1	2. 3	3	R 9	. 5
6200	273. 6	11	8. 2	12	20. 1	32	1	2. 2	3	R 9	. 6
6300	281. 8	11	8. 4	12	20. 5	33	1	2. 1	3	R 10	. 6
6400	290. 2	12	8. 6	12	21. 0	34	1	2. 0	3	R 10	. 6
6500	298. 8	12	8. 8	11	21. 5	34	1	1. 98	3	R 11	. 6
6600	307. 6	13	9. 0	11	22. 0	35	1	1. 92	3	R 11	. 6
6700	316. 6	13	9. 2	11	22. 6	36	1	1. 86	3	R 12	. 6
6800	325. 8	14	9. 4	11	23. 1	37	1	1. 80	3	R 12	. 7
6900	335. 4	14	9. 6	10	23. 6	37	1	1. 74	3	R 13	. 7
7000	345. 2	15	9. 8	10	24. 2	38	1	1. 68	3	R 13	. 7
7100	355. 2	16	10. 0	10	24. 7	39	1	1. 63	3	R 14	. 7
7200	365. 4	16	10. 2	10	25. 2	40	1	1. 58	3	R 14	. 7
7300	376. 0	17	10. 6	9	25. 8	41	1	1. 53	3	R 15	. 8
7400	386. 8	18	10. 8	9	26. 4	42	1	1. 48	4	R 15	. 8
7500	398. 0	19	11. 2	9	27. 1	43	1	1. 43	4	R 16	. 8
7600	409. 4	21	11. 6	9	27. 7	44	1	1. 38	4	R 16	. 8
7700	421. 2	22	12. 0	8	28. 3	45	1	1. 34	4	R 17	. 8
7800	433. 4	23	12. 4	8	29. 0	46	1	1. 29	4	R 18	. 8
7900	446. 0	24	13. 0	8	29. 7	47	1	1. 25	4	R 19	. 9
8000	459. 2	26	13. 6	7	30. 4	48	1	1. 20	4	R 20	. 9

*Drift includes side jump.

13	14	15	16	17	18	19	20	21	1
Complementary angle of site for each		Range Effect of Increase of—							
+1 mil of site	−1 mil of site	One + in weight of projectiles Two++ isstandard	One foot per second in MV	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Range setting for 1897 carriage (and models)	Range setting for M2 carriage	Range
		Wt.	VE	Temp.	W-R	Den.	Set.	Set.	R
ḿ	ḿ	yds.	yds.	yds.	yds.	yds.	m	yds.	yds.
+. 03	−. 03	+ 5	+2. 0	+1. 3	+ 4. 1	−15	4000	4125	4000
+. 03	−. 03	+ 6	+2. 0	+1. 3	+ 4. 3	−15	4105	4240	4100
+. 03	−. 03	+ 7	+2. 0	+1. 4	+ 4. 5	−16	4210	4350	4200
+. 04	−. 04	+ 8	+2. 0	+1. 5	+ 4. 7	−16	4320	4455	4300
+. 04	−. 04	+ 9	+2. 0	+1. 5	+ 4. 9	−17	4430	4565	4400
+. 04	−. 04	+10	+2. 0	+1. 6	+ 5. 1	−17	4540	4680	4500
+. 04	−. 04	+11	+2. 0	+1. 6	+ 5. 3	−17	4645	4795	4600
+. 04	−. 04	+12	+2. 0	+1. 7	+ 5. 5	−18	4750	4910	4700
+. 05	−. 05	+13	+2. 1	+1. 8	+ 5. 7	−18	4855	5025	4800
+. 05	−. 05	+14	+2. 1	+1. 9	+ 5. 9	−19	4955	5140	4900
+. 05	−. 05	+16	+2. 1	+2. 0	+ 6. 2	−19	5060	5250	5000
+. 05	−. 05	+17	+2. 1	+2. 1	+ 6. 4	−20	5165	5360	5100
+. 05	−. 05	+18	+2. 1	+2. 2	+ 6. 7	−20	5270	5475	5200
+. 06	−. 06	+20	+2. 1	+2. 2	+ 6. 9	−21	5375	5590	5300
+. 06	−. 06	+21	+2. 1	+2. 3	+ 7. 1	−21	5480	5700	5400
+. 06	−. 06	+22	+2. 1	+2. 4	+ 7. 4	−22	5575	5815	5500
+. 07	−. 07	+23	+2. 1	+2. 5	+ 7. 6	−22		5935	5600
+. 07	−. 07	+24	+2. 1	+2. 6	+ 7. 9	−23		6050	5700
+. 07	−. 07	+26	+2. 2	+2. 6	+ 8. 1	−23		6165	5800
+. 08	−. 08	+27	+2. 2	+2. 7	+ 8. 3	−24		6275	5900
+. 08	−. 08	+28	+2. 2	+2. 8	+ 8. 6	−25		6385	6000
+. 09	−. 09	+29	+2. 2	+2. 9	+ 8. 8	−25		6500	6100
+. 09	−. 09	+31	+2. 2	+3. 0	+ 9. 1	−26		6615	6200
+. 10	−. 10	+32	+2. 2	+3. 0	+ 9. 3	−26		6730	6300
+. 10	−. 10	+34	+2. 2	+3. 1	+ 9. 5	−27		6840	6400
+. 11	−. 11	+35	+2. 2	+3. 2	+ 9. 8	−27		6955	6500
+. 11	−. 11	+36	+2. 3	+3. 3	+10. 0	−28		7070	6600
+. 12	−. 12	+37	+2. 3	+3. 4	+10. 3	−28		7185	6700
+. 13	−. 12	+39	+2. 3	+3. 4	+10. 5	−29		7300	6800
+. 14	−. 13	+40	+2. 3	+3. 5	+10. 8	−29		7415	6900
+. 15	−. 14	+41	+2. 3	+3. 6	+11. 1	−30		7530	7000
+. 16	−. 14	+42	+2. 3	+3. 7	+11. 4	−30		7640	7100
+. 17	−. 15	+44	+2. 4	+3. 8	+11. 7	−31		7760	7200
+. 18	−. 16	+45	+2. 4	+3. 8	+11. 9	−31		7870	7300
+. 19	−. 17	+47	+2. 4	+3. 9	+12. 2	−32		7985	7400
+. 20	−. 18	+48	+2. 4	+4. 0	+12. 5	−33		8095	7500
+. 21	−. 19	+49	+2. 4	+4. 1	+12. 8	−33		8205	7600
+. 23	−. 20	+51	+2. 5	+4. 2	+13. 1	−34		8315	7700
+. 25	−. 21	+52	+2. 5	+4. 2	+13. 4	−34		8425	7800
+. 27	−. 23	+54	+2. 5	+4. 3	+13. 7	−35		8535	7900
+. 30	−. 25	+55	+2. 5	+4. 3	+14. 0	−36		8640	8000

Quadrant aiming

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F.	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second	−51	−44	−37	−29	−22	−15	−8	0	+8	+16	+25

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	5000	6000	7000
Cant of 10 mils, effect	0. 2	0. 4	0. 8	1. 3	1. 9	2. 6	3. 5
Range, yards	7000	8000	8500	9000	9070	9000	
Cant of 10 mils, effect	3. 5	4. 8	5. 8	7. 7	8. 9	10. 4	

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

SECTION IV

FIRING TABLES, 155-MM HOWITZER

Characteristics 155-mm howitzer, M1917, M1917A1, M1918, and M1918A1, firing HE shell Mk. I (narrow band)

155-MM HOWITZER

Diameter of the bore between lands	inches	6.102
Diameter of the bore between grooves	inches	6.178
Total length of howitzer	inches	91.81
Length of rifled portion	inches	68.39
Travel of projectile	inches	69.88
Capacity of powder chamber	cubic inches	425
Number of grooves		48
Character of rifling		uniform twist 1 in 25.5 calibers
Maximum pressure for which howitzer is designed	lb./sq. in.	30,000

155–MM HOWITZER CARRIAGE

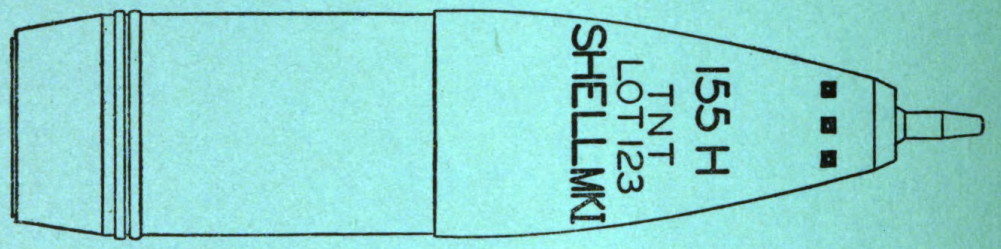
Total traverse (one-half on each side)	mils	105
Least possible elevation	mils	0
Greatest possible elevation	mils	752. 6
Traverse for one turn of traversing handwheel	mils	0. 41
Change in elevation for one turn of elevating handwheel	mils	4. 0
Horizontal site setting	mils	300

PROJECTILE—MEAN WEIGHT OF FUZED PROJECTILE IN POUNDS

P. D. fuzes, M46 and M47

Variations in weight are indicated by markings stenciled on the projectile as follows:

Marking	*Weight*
□ □	92. 5
□ □ □	93. 6
□ □ □ □ (Standard)	94. 7
□ □ □ □ □	95. 8
□ □ □ □ □ □	96. 9



CHARGES (HE SHELL, MK. I, NARROW BAND, FUZES, M46 AND M47*) FOR WHICH TABLES ARE NOT INCLUDED HEREIN

CHARGE 1 Muzzle velocity: 680 f/s.
Powder charge: Charge consists of base section No. 1. The cartridge cloth is dyed green. The igniter pad is on the rear end of the base section.
Maximum range: 4255 yards.

CHARGE 2 Muzzle velocity: 742 f/s.
Powder charge: Charge consists of base section and one increment, numbered respectively 1 and 2. The cartridge cloth is dyed green. The igniter pad is on the rear end of the base section.
Maximum range: 4910 yards.

* * * * *

CHARGE 7 Muzzle velocity: 1478 f/s.

Powder charge: Charge consists of base section and two increments, numbered respectively 5, 6, and 7. (Some M2 charges in storage are in 7 sections.) The cartridge cloth is white. The igniter pad is on the rear end of the base section.

Maximum range: 12,295 yards.

*Fuzes Mk. III and Mk. IV and shrapnel and chemical shell may also be used with this weapon. Tables and characteristics for these are not included herein.

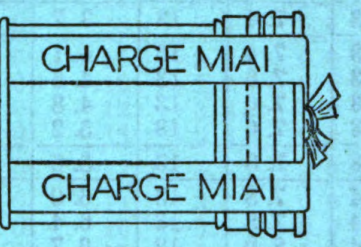
CHARGE 3

(MV 832 f/s)

Powder charge: Charge consists of base section and two increments, numbered respectively 1, 2, and 3. The cartridge cloth is dyed green. The igniter pad is on the rear end of the base section.

Maximum range: 5990 yards.

(Data for ranges 0—5990 included herein.)



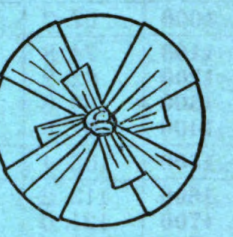


TABLE A

1	2	3	4	5	6	7	8	9	10
						Probable error			
Range R yds.	Elevation El mil	Fork F mil	Change in elevation for 100-yard change in range c mil	Change in range for 1-mil change in elevation 1 mil yds.	Time of flight Time sec.	Range e_{pr} yds.	Deflection e_{pd} yds.	Slope of fall Slope 1/—	Line number of metro message Line No.
0	−5.8	2	7.0	14	0.0	8	0		1
100	+1.2	2	7.2	14	0.4	8	0	140	1
200	8.4	2	7.2	14	0.7	8	0	70	1
300	15.6	2	7.2	14	1.1	8	0	46	1
400	23.0	2	7.2	14	1.4	8	0	35	1
500	30.2	2	7.2	14	1.8	8	0	28	1
600	37.6	2	7.4	14	2.2	9	0	23	1
700	44.8	2	7.4	13	2.6	9	0	19.7	1
800	52.2	3	7.4	13	2.9	9	0	17.2	1
900	59.8	3	7.4	13	3.3	9	0	15.2	1
1000	67.2	3	7.4	13	3.7	9	0	13.6	1
1100	74.8	3	7.4	13	4.1	10	0	12.3	1
1200	82.2	3	7.6	13	4.5	10	0	11.2	1
1300	89.8	3	7.6	13	4.8	10	0	10.3	1
1400	97.6	3	7.6	13	5.2	10	1	9.5	1
1500	105.4	3	7.8	13	5.6	10	1	8.9	1
1600	113.2	4	7.8	13	6.0	11	1	8.3	1
1700	121.0	4	7.8	13	6.4	11	1	7.7	1
1800	128.8	4	8.0	12	6.7	11	1	7.2	1
1900	136.8	4	8.0	12	7.1	12	1	6.8	1
2000	145.0	4	8.2	12	7.5	12	1	6.4	1
2100	153.0	5	8.2	12	7.9	12	1	6.1	1
2200	161.2	5	8.4	12	8.3	13	1	5.8	1
2300	169.6	5	8.4	12	8.7	13	1	5.5	1
2400	178.0	5	8.6	12	9.1	13	1	5.2	1
2500	186.6	5	8.6	12	9.5	14	1	5.0	1
2600	195.2	6	8.8	11	9.9	14	1	4.7	1
2700	204.0	6	8.8	11	10.3	15	1	4.5	1
2800	212.8	6	9.0	11	10.8	15	1	4.3	1
2900	221.8	6	9.0	11	11.2	16	1	4.1	1
3000	230.8	6	9.2	11	11.6	16	1	4.0	1
3100	240.0	7	9.2	11	12.1	17	1	3.8	1
3200	249.4	7	9.4	10	12.5	17	1	3.7	2
3300	259.0	7	9.6	10	13.0	17	1	3.5	2
3400	268.8	7	9.8	10	13.4	18	1	3.4	2
3500	278.6	7	10.0	10	13.9	18	1	3.2	2
3600	288.6	8	10.2	10	14.4	19	2	3.1	2
3700	299.0	8	10.4	10	14.9	19	2	2.9	2
3800	309.6	8	10.6	9	15.4	19	2	2.8	2
3900	320.4	9	10.8	9	15.9	20	2	2.7	2
4000	331.4	9	11.2	9	16.4	20	2	2.6	2

11	12	13	14	15	16	17	18	19	1
Deflection effect		Complementary angle of site for each		Range effect of increase of—					
Drift	Lateral wind of 1 mile per hour (+)	+1 mil of site	−1 mil of site	One square in weight of projectile. Four square is standard	One foot per second in *MV*	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Range
Dft.*	W-D			Wt.	VE	Temp.	W-R	Den.	R
mils	mils	mils	mils	yds.	yds.	yds.	yds.	yds.	yds.
L 4	0.0	.00	.00	0	0.0	0.0	0.0	0	0
L 4	0.0	.00	.00	−1	+0.2	0.0	0.0	0	100
L 4	0.0	.00	.00	−2	+0.4	0.0	0.0	0	200
L 4	0.0	.00	.00	−3	+0.7	0.0	0.0	0	300
L 4	0.0	.00	.00	−4	+0.9	0.0	0.0	0	400
L 3	0.0	.00	.00	−5	+1.1	0.0	+0.1	0	500
L 3	0.0	.00	.00	−6	+1.3	0.0	+0.1	0	600
L 3	0.0	.00	.00	−7	+1.6	0.0	+0.1	0	700
L 3	0.0	.00	.00	−8	+1.8	0.0	+0.1	0	800
L 3	0.0	.00	.00	−9	+2.1	0.0	+0.2	0	900
L 2	0.0	+.01	−.01	−10	+2.3	0.0	+0.2	0	1000
L 2	0.0	+.01	−.01	−11	+2.5	0.0	+0.2	0	1100
L 2	0.0	+.01	−.01	−12	+2.7	0.0	+0.2	0	1200
L 2	0.0	+.02	−.01	−12	+3.0	0.0	+0.3	0	1300
L 2	0.0	+.02	−.01	−13	+3.2	0.0	+0.3	0	1400
L 1	0.1	+.02	−.01	−14	+3.4	0.0	+0.3	0	1500
L 1	0.1	+,02	−.01	−15	+3.6	0.0	+0.3	−1	1600
L 1	0.1	+.02	−.01	−16	+3.8	0.0	+0.4	−1	1700
L 1	0.1	+.03	−.02	−17	+4.1	0.0	+0.4	−1	1800
0	0.1	+.03	−.02	−18	+4.3	0.0	+0.4	−1	1900
0	0.1	+.03	−.02	−19	+4.5	0.0	+0.4	−1	2000
0	0.1	+.04	−.02	−20	+4.7	0.0	+0.5	−1	2100
0	0.1	+.04	−.03	−21	+4.9	0.0	+0.5	−1	2200
R 1	0.1	+.04	−.03	−21	+5.2	0.0	+0.5	−1	2300
R 1	0.1	+.05	−.03	−22	+5.4	0.0	+0.6	−1	2400
R 1	0.1	+.05	−.04	−23	+5.6	0.0	+0.6	−1	2500
R 1	0.1	+.06	−.04	−24	+5.8	0.0	+0.6	−2	2600
R 2	0.1	+.06	−.05	−25	+6.0	0.0	+0.7	−2	2700
R 2	0.1	+.07	−.06	−25	+6.2	0.0	+0.7	−2	2800
R 2	0.1	+.07	−.06	−26	+6.4	0.0	+0.8	−2	2900
R 2	0.1	+.08	−.07	−27	+6.6	0.0	+0.8	−2	3000
R 2	0.1	+.08	−.08	−28	+6.8	0.0	+0.8	−2	3100
R 3	0.1	+.09	−.08	−28	+7.0	0.0	+0.9	−2	3200
R 3	0.1	+.09	−.09	−29	+7.2	0.0	+0.9	−2	3300
R 3	0.1	+.10	−.10	−29	+7.4	0.0	+1.0	−3	3400
R 3	0.1	+.11	−.11	−30	+7.6	0.0	+1.0	−3	3500
R 4	0.1	+.12	−.12	−31	+7.8	0.0	+1.1	−3	3600
R 4	0.1	+.13	−.13	−31	+8.0	0.0	+1.1	−3	3700
R 4	0.1	+.14	−.14	−32	+8.2	0.0	+1.2	−3	3800
R 5	0.1	+.15	−.15	−32	+8.4	0.0	+1.2	−4	3900
R 5	0.1	+.16	−.16	−33	+8.6	−0.1	+1.3	−4	4000

*Drift includes side jump.

1	2	3	4	5	6	7	8	9	10
						Probable error			
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Slope of fall	Line number of metro message
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}	Slope	Line
yds.	m	m	m	yds.	sec.	yds.	yds.	1/–	No.
4000	331. 4	9	11. 2	9	16. 4	20	2	2. 6	2
4100	342. 6	9	11. 4	9	16. 9	21	2	2. 5	2
4200	354. 0	10	11. 6	8	17. 5	21	2	2. 4	2
4300	365. 8	10	12. 0	8	18. 0	21	2	2. 3	2
4400	378. 0	10	12. 4	8	18. 6	22	2	2. 2	2
4500	390. 6	11	12. 8	8	19. 1	22	2	2. 2	2
4600	403. 6	11	13. 2	7	19. 7	23	2	2. 1	3
4700	417. 2	12	13. 8	7	20. 3	23	2	2. 0	3
4800	431. 2	13	14. 4	7	20. 9	24	2	1. 95	3
4900	445. 8	14	15. 0	7	21. 5	24	2	1. 87	3
5000	461. 2	15	15. 8	6	22. 1	25	2	1. 79	3
5100	477. 4	17	16. 8	6	22. 8	26	2	1. 72	3
5200	494. 6	19	17. 8	6	23. 5	26	2	1. 64	3
5300	513. 0	21	19. 0	5	24. 3	27	2	1. 57	3
5400	532. 8	23	20. 6	5	25. 1	27	2	1. 49	3
5500	554. 4	25	22. 8	4	26. 0	28	2	1. 42	3
5600	578. 4	28	25. 4	4	26. 9	28	3	1. 34	3
5700	605. 8	34	29. 2	3	28. 0	29	3	1. 26	4
5800	638. 0	43	36. 0	3	29. 3	30	3	1. 17	4
5900	684. 0	-----	-------	------	30. 8	31	3	1. 07	4
5990	773. 0	-----	-------	------	34. 1	32	4	0. 89	5

11	12	13	14	15	16	17	18	19	1
Deflection effect		Complementary angle of site for each		Range effect of increase of—					
Drift Dft.*	Lateral wind of 1 mile per hour(+) W-D	+1 mil of site	−1 mil of site	One square in weight of projectile. Four square is standard Wt.	One foot per second in *MV* VE	Air temperature 1°. Standard is 59° F. Temp.	Rear wind 1 mile per hour W-R	One percent in air density Den.	Range R
ṁ	ṁ	ṁ	ṁ	yds.	yds.	yds.	yds.	yds.	yds.
R 5	0. 1	+ . 16	− . 16	−33	+ 8. 6	−0. 1	+1. 3	− 4	4000
R 5	0. 1	+ . 17	− . 17	−34	+ 8. 8	−0. 1	+1. 3	− 4	4100
R 6	0. 1	+ . 19	− . 18	−35	+ 9. 0	−0. 1	+1. 4	− 4	4200
R 6	0. 2	+ . 21	− . 19	−35	+ 9. 3	−0. 1	+1. 4	− 4	4300
R 6	0. 2	+ . 23	− . 21	−36	+ 9. 5	−0. 1	+1. 5	− 5	4400
R 7	0. 2	+ . 25	− . 23	−37	+ 9. 7	−0. 1	+1. 5	− 5	4500
R 7	0. 2	+ . 27	− . 25	−38	+ 9. 9	−0. 1	+1. 6	− 5	4600
R 8	0. 2	+ . 29	− . 27	−38	+10. 1	−0. 1	+1. 6	− 5	4700
R 8	0. 2	+ . 32	− . 29	−39	+10. 3	−0. 1	+1. 7	− 6	4800
R 9	0. 2	+ . 36	− . 32	−39	+10. 5	−0. 1	+1. 7	− 6	4900
R 10	0. 2	+ . 41	− . 36	−40	+10. 7	−0. 1	+1. 8	− 6	5000
R 11	0. 2	+ . 46	− . 40	−40	+10. 9	−0. 1	+1. 9	− 6	5100
R 11	0. 2	+ . 52	− . 45	−41	+11. 1	−0. 1	+2. 0	− 7	5200
R 12	0. 2	+ . 60	− . 51	−41	+11. 3	−0. 1	+2. 0	− 7	5300
R 12	0. 2	+ . 71	− . 58	−42	+11. 5	−0. 1	+2. 1	− 7	5400
R 13	0. 2	+ . 84	− . 68	−42	+11. 7	−0. 1	+2. 2	− 8	5500
R 14	0. 3	+1. 01	− . 80	−42	+11. 9	−0. 1	+2. 3	− 8	5600
R 15	0. 3	+1. 36	− . 95	−43	+12. 1	−0. 1	+2. 5	− 8	5700
R 17	0. 3	+2. 72	−1. 18	−43	+12. 2	−0. 1	+2. 7	− 9	5800
R 19	0. 3	-------	−1. 60	−43	+12. 3	−0. 1	+3. 0	− 9	5900
R 23	0. 3	-------	−3. 09	−43	+12. 4	−0. 1	+3. 6	−10	5990

* Drift includes side jump.

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F.	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second	−19	−17	−14	−12	−9	−6	−3	0	+3	+6	+9

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	4500	5000
Cant of 10 mils, effect	0. 7	1. 5	2. 4	3. 4	4. 1	4. 9

Range, yards	5000	5500	5600	5700	5800	5900	5990
Cant of 10 mils, effect	4. 9	6. 1	6. 5	6. 9	7. 3	8. 0	9. 7

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

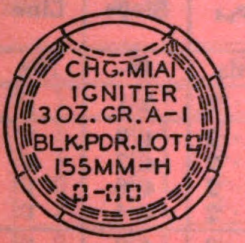
CHARGE 4

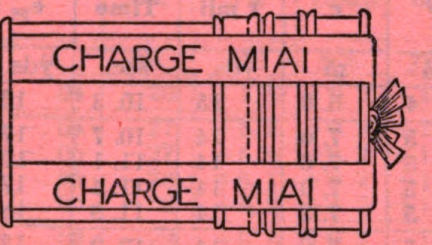
(MV 939 f/s)

Powder charge: Charge consists of base section and three increments, numbered respectively 1, 2, 3, and 4. The cartridge cloth is dyed green. The igniter pad is on the rear end of the base section.

Maximum range: 7360 yards.

(Data for ranges 3000—7000 included herein.)





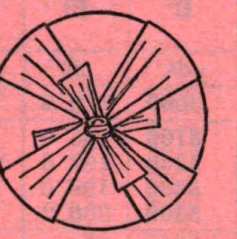


TABLE A

1	2	3	4	5	6	7	8	9	10
						Probable error			
Range R	Elevation El	Fork F	Change in elevation for 100-yard change in range c	Change in range for 1-mil change in elevation 1 mil	Time of flight Time	Range e_{pr}	Deflection e_{pd}	Slope of fall Slope	Line number of metro message Line
yds.	m	m	m	yds.	sec.	yds.	yds.	1/–	No.
3000	178. 2	4	6. 8	15	10. 3	16	2	5. 1	1
3100	185. 0	5	7. 0	14	10. 7	17	2	4. 9	1
3200	192. 0	5	7. 0	14	11. 1	17	2	4. 7	1
3300	199. 0	5	7. 0	14	11. 4	17	2	4. 6	1
3400	206. 2	5	7. 2	14	11. 8	18	2	4. 4	1
3500	213. 4	5	7. 2	14	12. 2	18	2	4. 2	1
3600	220. 6	6	7. 4	14	12. 6	19	2	4. 1	2
3700	228. 0	6	7. 4	13	13. 0	19	2	3. 9	2
3800	235. 4	6	7. 6	13	13. 4	19	2	3. 8	2
3900	243. 0	6	7. 6	13	13. 8	20	2	3. 7	2
4000	250. 8	6	7. 8	13	14. 2	20	2	3. 5	2
4100	258. 6	7	7. 8	13	14. 6	21	2	3. 4	2
4200	266. 4	7	8. 0	13	15. 0	21	2	3. 3	2
4300	274. 4	7	8. 0	12	15. 4	21	2	3. 2	2
4400	282. 6	7	8. 2	12	15. 8	22	2	3. 1	2
4500	291. 0	7	8. 4	12	16. 3	22	2	3. 0	2
4600	299. 4	8	8. 4	12	16. 7	23	2	2. 9	2
4700	308. 0	8	8. 6	12	17. 2	23	2	2. 8	2
4800	316. 6	8	8. 8	11	17. 6	23	2	2. 7	2
4900	325. 4	9	9. 0	11	18. 1	24	2	2. 7	2
5000	334. 4	9	9. 2	11	18. 5	24	2	2. 6	2
5100	343. 6	10	9. 2	11	19. 0	25	3	2. 5	2
5200	352. 8	10	9. 4	11	19. 5	25	3	2. 4	3
5300	362. 4	10	9. 6	10	19. 9	25	3	2. 3	3
5400	372. 2	11	10. 0	10	20. 4	26	3	2. 3	3
5500	382. 2	11	10. 2	10	20. 9	26	3	2. 2	3
5600	392. 4	12	10. 4	10	21. 4	27	3	2. 1	3
5700	403. 0	12	10. 6	9	21. 9	27	3	2. 1	3
5800	413. 8	12	11. 0	9	22. 4	27	3	2. 00	3
5900	425. 0	13	11. 4	9	22. 9	28	3	1. 94	3
6000	436. 6	13	11. 8	9	23. 5	28	3	1. 88	3
6100	448. 6	14	12. 2	8	24. 1	29	3	1. 82	3
6200	461. 0	14	12. 6	8	24. 7	29	3	1. 76	3
6300	473. 8	15	13. 2	8	25. 3	29	3	1. 70	3
6400	487. 2	16	13. 8	7	25. 9	30	3	1. 64	3
6500	501. 4	17	14. 6	7	26. 6	30	3	1. 58	3
6600	516. 4	18	15. 6	6	27. 3	31	3	1. 52	4
6700	532. 4	20	16. 8	6	28. 1	31	3	1. 46	4
6800	549. 6	22	18. 2	6	28. 9	31	4	1. 40	4
6900	568. 6	25	20. 0	5	29. 7	32	4	1. 34	4
7000	590. 0	29	22. 4	5	30. 6	32	4	1. 28	4

11	12	13	14	15	16	17	18	19	1
Deflection effect		Complementary angle of site for each		Range effect of increase of—					
Drift Dft.*	Lateral wind of 1 mile per hour (+) W-D	+1 mil of site	−1 mil of site	One square in weight of projectile. Four square is standard Wt.	One foot per second in *MV* VE	Air temperature 1°. Standard is 59° F. Temp.	Rear wind 1 mile per hour W-R	One percent in air density Den.	Range R
m′	m′	m′	m′	yds.	yds.	yds.	yds.	yds.	yds.
R 1	0.1	+.04	−.04	−26	+5.6	+0.2	+1.2	−2	3000
R 1	0.1	+.04	−.04	−27	+5.8	+0.2	+1.3	−2	3100
R 1	0.1	+.05	−.05	−27	+5.9	+0.2	+1.3	−2	3200
R 2	0.1	+.05	−.05	−28	+6.1	+0.2	+1.4	−2	3300
R 2	0.1	+.06	−.06	−28	+6.2	+0.2	+1.4	−2	3400
R 2	0.1	+.06	−.06	−29	+6.4	+0.2	−1.5	−3	3500
R 2	0.1	+.06	−.06	−30	+6.6	+0.2	+1.6	−3	3600
R 3	0.1	+.07	−.07	−30	+6.7	+0.2	+1.6	−3	3700
R 3	0.1	+.07	−.07	−31	+6.9	+0.2	+1.7	−3	3800
R 3	0.1	+.08	−.08	−31	+7.0	+0.2	+1.7	−3	3900
R 3	0.1	+.08	−.08	−32	+7.2	+0.3	+1.8	−3	4000
R 3	0.1	+.09	−.09	−33	+7.4	+0.3	+1.9	−4	4100
R 4	0.1	+.09	−.09	−33	+7.5	+0.3	+2.0	−4	4200
R 4	0.1	+.10	−.10	−34	+7.7	+0.3	+2.0	−4	4300
R 4	0.1	+.10	−.10	−34	+7.8	+0.3	+2.1	−4	4400
R 4	0.1	+.11	−.11	−35	+8.0	+0.3	+2.2	−4	4500
R 5	0.1	+.12	−.12	−35	+8.2	+0.3	+2.3	−5	4600
R 5	0.1	+.13	−.13	−36	+8.3	+0.3	+2.3	−5	4700
R 5	0.1	+.14	−.13	−36	+8.5	+0.3	+2.4	−5	4800
R 6	0.1	+.15	−.14	−37	+8.6	+0.3	+2.4	−5	4900
R 6	0.2	+.16	−.15	−37	+8.8	+0.3	+2.5	−5	5000
R 6	0.2	+.17	−.16	−38	+9.0	+0.3	+2.6	−6	5100
R 7	0.2	+.18	−.17	−38	+9.2	+0.4	+2.6	−6	5200
R 7	0.2	+.19	−.18	−39	+9.3	+0.4	+2.7	−6	5300
R 7	0.2	+.20	−.19	−39	+9.5	+0.4	+2.7	−6	5400
R 7	0.2	+.22	−.20	−40	+9.7	+0.4	+2.8	−7	5500
R 7	0.2	+.24	−.21	−41	+9.9	+0.4	+2.9	−7	5600
R 8	0.2	+.26	−.22	−41	+10.1	+0.4	+2.9	−7	5700
R 8	0.2	+.28	−.24	−42	+10.2	+0.4	+3.0	−7	5800
R 9	0.2	+.30	−.26	−42	+10.4	+0.4	+3.0	−8	5900
R 9	0.2	+.32	−.28	−43	+10.6	+0.4	+3.1	−8	6000
R 9	0.2	+.35	−.30	−44	+10.8	+0.4	+3.2	−8	6100
R 10	0.2	+.38	−.33	−44	+11.0	+0.4	+3.2	−9	6200
R 10	0.2	+.42	−.36	−45	+11.1	+0.4	+3.3	−9	6300
R 11	0.2	+.46	−.40	−45	+11.3	+0.4	+3.3	−9	6400
R 11	0.2	+.51	−.44	−46	+11.5	+0.4	+3.4	−10	6500
R 12	0.2	+.58	−.49	−46	+11.7	+0.4	+3.5	−10	6600
R 13	0.2	+.66	−.56	−47	+11.9	+0.4	+3.5	−10	6700
R 13	0.3	+.77	−.65	−47	+12.1	+0.3	+3.6	−11	6800
R 14	0.3	+.92	−.75	−48	+12.3	+0.3	+3.6	−11	6900
R 15	0.3	+1.19	−.87	−48	+12.5	+0.3	+3.7	−12	7000

*Drift includes side jump.

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F.	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second	−18	−16	−14	−12	−9	−6	−3	0	+3	+6	+9

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	5000	6000	6500
Cant of 10 mils, effect	0. 6	1. 2	1. 8	2. 6	3. 5	4. 6	5. 4

Range yards	6500	7000	7100	7200	7300	7360
Cant of 10 mils, effect	5. 4	6. 6	7. 0	7. 4	8. 1	9. 3

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

CHARGE 5

(MV 1083 f/s)

Powder charge: M1A1. Charge M1A1 consists of base section and four increments, numbered respectively 1, 2, 3, 4, and 5. The cartridge cloth is dyed green. The igniter pad is on the rear end of the base section.

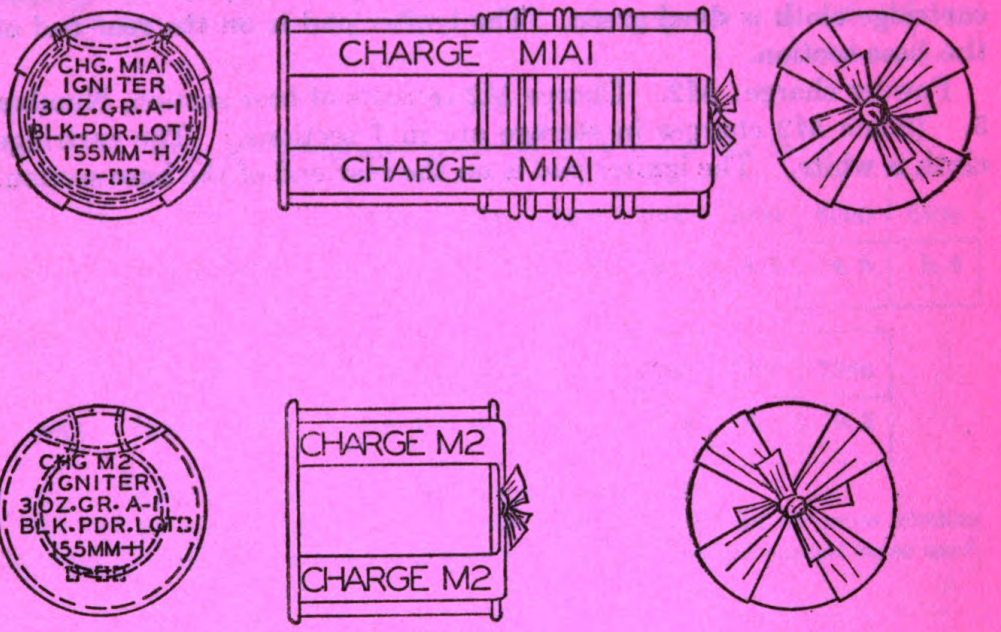
Powder charge: M2. Charge M2 consists of base section, Number 5. (Some M2 charges in storage are in 7 sections.) The cartridge cloth is white. The igniter pad is on the rear end of the base section.

273090°—40——7

For firing Charge 5, either Charge M1A1 or Charge M2, prepared as shown in the figure, may be used but preferably the former.

Maximum range: 9295 yards.

(Data for ranges 5000–9000 included herein)



ABBREVIATED FIRING TABLES

TABLE A

1	2	3	4	5	6	7	8	9	10
						Probable error			
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Slope of fall	Line, number of metro message
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}	Slope	Line
yds.	m	m	m	yds.	sec.	yds.	yds.	1/—	No.
5000	250. 2	8	6. 4	16	16. 0	30	3	3. 4	2
5100	256. 6	8	6. 4	16	16. 4	31	3	3. 3	2
5200	263. 0	8	6. 6	15	16. 7	31	3	3. 3	2
5300	269. 6	8	6. 6	15	17. 1	31	3	3. 2	2
5400	276. 2	8	6. 8	15	17. 5	32	3	3. 1	2
5500	282. 8	9	6. 8	15	17. 9	32	3	3. 0	2
5600	289. 6	9	6. 8	15	18. 3	33	3	2. 9	2
5700	296. 4	9	7. 0	14	18. 7	33	3	2. 8	2
5800	303. 4	10	7. 0	14	19. 1	34	3	2. 8	2
5900	310. 4	10	7. 2	14	19. 5	34	3	2. 7	3
6000	317. 6	10	7. 2	14	19. 9	34	3	2. 6	3
6100	324. 8	10	7. 4	14	20. 3	35	3	2. 6	3
6200	332. 2	10	7. 4	14	20. 7	35	3	2. 5	3
6300	339. 8	11	7. 6	13	21. 2	36	3	2. 4	3
6400	347. 4	11	7. 6	13	21. 6	36	3	2. 4	3
6500	355. 0	11	7. 8	13	22. 0	37	3	2. 3	3
6600	362. 8	12	7. 8	13	22. 5	37	3	2. 3	3
6700	370. 8	12	8. 0	12	22. 9	37	3	2. 2	3
6800	379. 0	12	8. 2	12	23. 4	38	4	2. 1	3
6900	387. 2	13	8. 2	12	23. 8	38	4	2. 1	3
7000	395. 6	13	8. 4	12	24. 3	39	4	2. 0	3
7100	404. 2	14	8. 6	12	24. 7	39	4	1. 99	3
7200	413. 0	14	8. 8	11	25. 2	40	4	1. 94	3
7300	421. 8	15	9. 0	11	25. 7	40	4	1. 89	3
7400	431. 0	15	9. 2	11	26. 2	41	4	1. 85	3
7500	440. 4	16	9. 4	11	26. 7	41	4	1. 80	3
7600	450. 0	16	9. 6	10	27. 2	42	4	1. 75	3
7700	459. 8	17	9. 8	10	27. 8	42	4	1. 71	4
7800	470. 0	17	10. 2	10	28. 3	42	4	1. 66	4
7900	480. 4	18	10. 6	9	28. 9	43	4	1. 62	4
8000	491. 2	19	11. 0	9	29. 4	43	4	1. 57	4
8100	502. 4	20	11. 4	9	30. 0	44	4	1. 53	4
8200	514. 0	21	11. 8	8	30. 6	44	4	1. 49	4
8300	526. 0	22	12. 4	8	31. 3	45	4	1. 44	4
8400	538. 6	23	13. 0	8	31. 9	45	5	1. 40	4
8500	552. 0	25	13. 8	7	32. 6	46	5	1. 36	4
8600	566. 2	27	14. 6	7	33. 3	46	5	1. 32	4
8700	581. 2	29	15. 6	6	34. 1	46	5	1. 27	5
8800	597. 6	32	17. 0	6	34. 9	47	5	1. 23	5
8900	615. 4	36	18. 8	5	35. 7	47	5	1. 18	5
9000	635. 6	41	21. 6	5	36. 7	48	5	1. 13	5

11	12	13	14	15	16	17	18	19	20	1
Deflection effect		Complementary angle of site for each		Range effect of increase of—						
Drift	Lateral wind of 1 mile per hour (+)	+1 mil of site	−1 mil of site	One square in weight of projectile. Four square is standard	One square in weight of projectile. Four square is standard	One foot per second in *MV*	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Range
Dft.[1]	W-D			Wt.[2]	Wt.[3]	VE	Temp.	W–R	Den.	R
mil	mil	mil	mil	yds.	yds.	yds.	yds.	yds.	yds.	yds.
R 5	0. 2	+. 08	−. 08	−28	−12	+6. 2	+3. 0	+4. 4	−6	5000
R 5	0. 2	+. 08	−. 08	−29	−12	+6. 3	+3. 1	+4. 5	−6	5100
R 6	0. 2	+. 09	−. 09	−29	−12	+6. 4	+3. 1	+4. 6	−7	5200
R 6	0. 2	+. 09	−. 09	−29	−12	+6. 5	+3. 2	+4. 8	−7	5300
R 6	0. 2	+. 10	−. 10	−30	−12	+6. 6	+3. 2	+4. 9	−7	5400
R 6	0. 2	+. 10	−. 10	−30	−12	+6. 7	+3. 3	+5. 0	−7	5500
R 6	0. 2	+. 10	−. 10	−30	−12	+6. 8	+3. 4	+5. 1	−8	5600
R 7	0. 2	+. 11	−. 11	−30	−12	+6. 9	+3. 4	+5. 3	−8	5700
R 7	0. 2	+. 11	−. 11	−31	−12	+7. 0	+3. 5	+5. 4	−8	5800
R 7	0. 2	+. 12	−. 12	−31	−12	+7. 1	+3. 5	+5. 6	−9	5900
R 7	0. 2	+. 12	−. 12	−31	−13	+7. 2	+3. 6	+5. 7	−9	6000
R 7	0. 2	+. 13	−. 13	−31	−13	+7. 3	+3. 6	+5. 8	−9	6100
R 7	0. 2	+. 13	−. 13	−32	−13	+7. 4	+3. 7	+6. 0	−10	6200
R 8	0. 2	+. 14	−. 14	−32	−13	+7. 5	+3. 7	+6. 1	−10	6300
R 8	0. 2	+. 14	−. 14	−32	−13	+7. 6	+3. 8	+6. 3	−10	6400
R 8	0. 2	+. 15	−. 15	−32	−13	+7. 7	+3. 8	+6. 4	−10	6500
R 8	0. 2	+. 16	−. 16	−33	−13	+7. 8	+3. 8	+6. 5	−11	6600
R 9	0. 2	+. 16	−. 16	−33	−13	+7. 9	+3. 9	+6. 6	−11	6700
R 9	0. 2	+. 17	−. 17	−33	−13	+8. 0	+3. 9	+6. 8	−11	6800
R 9	0. 2	+. 18	−. 18	−33	−13	+8. 1	+4. 0	+6. 9	−11	6900
R 9	0. 2	+. 19	−. 19	−33	−13	+8. 2	+4. 0	+7. 0	−12	7000
R 10	0. 2	+. 20	−. 20	−34	−13	+8. 3	+4. 0	+7. 1	−12	7100
R 10	0. 2	+. 21	−. 21	−34	−13	+8. 5	+4. 1	+7. 2	−12	7200
R 10	0. 2	+. 22	−. 22	−34	−13	+8. 6	+4. 1	+7. 4	−12	7300
R 10	0. 2	+. 24	−. 24	−34	−13	+8. 7	+4. 2	+7. 5	−13	7400
R 10	0. 2	+. 26	−. 25	−34	−12	+8. 8	+4. 2	+7. 6	−13	7500
R 11	0. 2	+. 28	−. 27	−35	−12	+8. 9	+4. 2	+7. 7	−13	7600
R 11	0. 2	+. 30	−. 28	−35	−12	+9. 0	+4. 2	+7. 8	−14	7700
R 11	0. 3	+. 32	−. 30	−35	−12	+9. 1	+4. 3	+7. 9	−14	7800
R 12	0. 3	+. 34	−. 32	−36	−12	+9. 2	+4. 3	+8. 0	−14	7900
R 12	0. 3	+. 37	−. 34	−36	−12	+9. 4	+4. 3	+8. 1	−15	8000
R 12	0. 3	+. 41	−. 36	−36	−12	+9. 5	+4. 3	+8. 2	−15	8100
R 13	0. 3	+. 45	−. 39	−37	−12	+9. 6	+4. 3	+8. 3	−15	8200
R 13	0. 3	+. 49	−. 42	−37	−12	+9. 8	+4. 4	+8. 3	−16	8300
R 14	0. 3	+. 53	−. 46	−37	−12	+9. 9	+4. 4	+8. 4	−16	8400
R 14	0. 3	+. 58	−. 51	−37	−12	+10. 0	+4. 4	+8. 5	−17	8500
R 15	0. 3	+. 63	−. 57	−38	−12	+10. 2	+4. 4	+8. 6	−17	8600
R 15	0. 3	+. 69	−. 64	−38	−12	+10. 3	+4. 4	+8. 7	−18	8700
R 16	0. 3	+. 78	−. 72	−38	−12	+10. 5	+4. 4	+8. 7	−18	8800
R 16	0. 3	+. 96	−. 81	−39	−12	+10. 7	+4. 4	+8. 8	−19	8900
R 17	0. 3	+1. 39	−. 94	−39	−12	+10. 8	+4. 4	+8. 8	−19	9000

[1] Drift includes side jump.
[2] These values are to be used with propelling charge M1A1 (green bag).
[3] These values are to be used with propelling charge M2 (white bag).

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F.	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second. Propelling Charge M1A1 (green bag)	−17	−15	−13	−10	− 8	−5	−3	0	+2	+5	+ 8
Change in velocity, feet per second. Propelling Charge M2 (white bag)	−27	−23	−20	−16	−12	−8	−4	0	+4	+8	+12

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	5000	6000	7000
Cants of 10 mils, effect	0. 4	0. 9	1. 4	2. 0	2. 6	3. 3	4. 2

Range, yards	7000	8000	8500	9000	9100	9200	9295
Cant of 10 mils, effect	4. 2	5. 3	6. 1	7. 3	7. 6	8. 1	9. 4

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

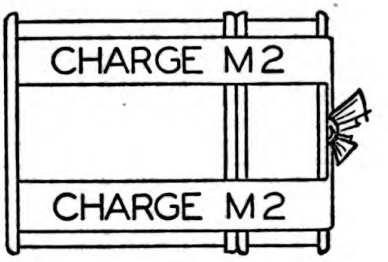
CHARGE 6

(MV 1359 f/s)

Powder charge: Charge consists of base section and one increment, numbered 5 and 6 respectively. (Some M2 charges in storage are in 7 sections.) The cartridge cloth is white. The igniter pad is on the rear end of the base section.

Maximum range: 11,460 yards.

(Data for ranges 7000—11,000 included herein.)



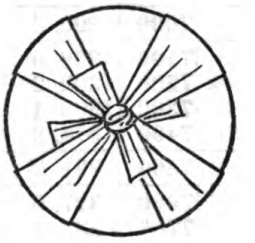


TABLE A

1	2	3	4	5	6	7	8	9	10
						Probable error			
Range	Elevation	Fork	Change in elevation for 100-yard change in range	Change in range for 1-mil change in elevation	Time of flight	Range	Deflection	Slope of fall	Line number of metro message
R	El	F	c	1 mil	Time	e_{pr}	e_{pd}	Slope	Line
yds.	m	m	m	yds.	sec.	yds.	yds.	1/–	No.
7000	290. 0	9	6. 0	16	20. 9	35	5	2. 7	3
7100	296. 0	10	6. 2	16	21. 3	35	5	2. 6	3
7200	302. 2	10	6. 2	16	21. 7	36	5	2. 5	3
7300	308. 4	10	6. 2	16	22. 1	36	5	2. 5	3
7400	314. 8	10	6. 4	16	22. 5	37	5	2. 4	3
7500	321. 2	10	6. 4	15	22. 9	37	5	2. 4	3
7600	327. 6	11	6. 4	15	23. 2	37	5	2. 3	3
7700	334. 2	11	6. 6	15	23. 6	38	5	2. 3	3
7800	340. 8	11	6. 6	15	24. 0	38	5	2. 2	3
7900	347. 4	11	6. 6	15	24. 4	39	5	2. 2	3
8000	354. 2	11	6. 8	15	24. 9	39	5	2. 1	3
8100	361. 0	12	6. 8	14	25. 3	39	5	2. 1	3
8200	368. 0	12	7. 0	14	25. 7	40	5	2. 0	3
8300	375. 0	12	7. 0	14	26. 2	40	5	1. 99	3
8400	382. 0	12	7. 0	14	26. 6	41	5	1. 95	3
8500	389. 2	12	7. 2	14	27. 0	41	5	1. 91	3
8600	396. 4	13	7. 2	14	27. 5	41	5	1. 87	4
8700	403. 8	13	7. 4	13	27. 9	42	5	1. 83	4
8800	411. 4	13	7. 6	13	28. 4	42	5	1. 79	4
8900	419. 0	13	7. 6	13	28. 8	43	6	1. 75	4
9000	426. 6	14	7. 8	13	29. 3	43	6	1. 72	4
9100	434. 4	14	7. 8	13	29. 8	43	6	1. 68	4
9200	442. 4	15	8. 0	12	30. 3	44	6	1. 64	4
9300	450. 4	15	8. 2	12	30. 7	44	6	1. 61	4
9400	458. 6	16	8. 2	12	31. 2	45	6	1. 58	4
9500	467. 0	16	8. 4	12	31. 7	45	6	1. 54	4
9600	475. 6	17	8. 6	11	32. 2	45	6	1. 51	4
9700	484. 4	17	8. 8	11	32. 7	46	6	1. 48	4
9800	493. 4	18	9. 0	11	33. 3	46	6	1. 44	5
9900	502. 6	18	9. 2	11	33. 8	47	6	1. 41	5
10000	512. 0	19	9. 6	10	34. 3	47	6	1. 38	5
10100	521. 6	19	10. 0	10	34. 9	47	7	1. 35	5
10200	531. 6	20	10. 4	10	35. 5	48	7	1. 32	5
10300	542. 2	21	10. 8	9	36. 1	48	7	1. 29	5
10400	553. 4	22	11. 4	9	36. 7	49	7	1. 26	5
10500	565. 0	24	12. 0	8	37. 3	49	7	1. 22	5
10600	577. 2	25	12. 8	8	38. 0	49	7	1. 19	5
10700	590. 2	26	13. 6	7	38. 7	50	7	1. 16	6
10800	604. 2	28	14. 6	7	39. 5	50	7	1. 12	6
10900	619. 2	31	15. 8	6	40. 3	50	8	1. 09	6
11000	635. 6	35	17. 4	6	41. 2	50	8	1. 05	6

11	12	13	14	15	16	17	18	19	1
Deflection effect		Complementary angle of site for each		Range effect of increase of—					
Drift	Lateral wind of 1 mile per hour (+)	+1 mil of site	−1 mil of site	One square in weight of projectile. Four square is standard	One foot per second in *MV*	Air temperature 1°. Standard is 59° F.	Rear wind 1 mile per hour	One percent in air density	Range
Dft.*	W-D			Wt.	VE	Temp.	W-R	Den.	R
mils	mils	mils	mils	yds.	yds.	yds.	yds.	yds.	yds.
R 6	0.3	+.10	−.10	−6	+5.6	+3.6	+7.4	−16	7000
R 6	0.3	+.10	−.10	−6	+5.6	+3.7	+7.6	−17	7100
R 7	0.3	+.10	−.10	−6	+5.7	+3.8	+7.8	−17	7200
R 7	0.3	+.11	−.11	−5	+5.7	+3.9	+7.9	−18	7300
R 7	0.3	+.11	−.11	−5	+5.8	+4.0	+8.1	−18	7400
R 7	0.4	+.11	−.11	−5	+5.8	+4.1	+8.3	−18	7500
R 7	0.4	+.12	−.12	−5	+5.8	+4.2	+8.5	−19	7600
R 8	0.4	+.12	−.12	−4	+5.9	+4.3	+8.6	−19	7700
R 8	0.4	+.13	−.13	−4	+5.9	+4.3	+8.8	−19	7800
R 8	0.4	+.13	−.13	−4	+6.0	+4.4	+9.0	−20	7900
R 8	0.4	+.13	−.13	−3	+6.0	+4.5	+9.2	−20	8000
R 8	0.4	+.13	−.13	−3	+6.0	+4.6	+9.4	−21	8100
R 9	0.4	+.14	−.14	−3	+6.1	+4.7	+9.6	−21	8200
R 9	0.4	+.14	−.14	−3	+6.1	+4.7	+9.7	−21	8300
R 9	0.4	+.15	−.15	−2	+6.2	+4.8	+9.9	−22	8400
R 9	0.4	+.15	−.15	−2	+6.2	+4.9	+10.1	−22	8500
R 9	0.4	+.16	−.16	−2	+6.2	+5.0	+10.3	−23	8600
R 10	0.4	+.16	−.16	−1	+6.2	+5.0	+10.5	−23	8700
R 10	0.4	+.17	−.17	−1	+6.3	+5.1	+10.7	−24	8800
R 10	0.4	+.17	−.17	0	+6.3	+5.1	+10.9	−24	8900
R 10	0.4	+.18	−.18	0	+6.3	+5.2	+11.1	−24	9000
R 10	0.4	+.19	−.19	0	+6.3	+5.3	+11.3	−25	9100
R 11	0.4	+.20	−.20	0	+6.4	+5.3	+11.5	−25	9200
R 11	0.4	+.21	−.20	+1	+6.4	+5.4	+11.7	−26	9300
R 11	0.4	+.22	−.21	+1	+6.5	+5.4	+11.9	−26	9400
R 11	0.4	+.23	−.22	+1	+6.5	+5.5	+12.1	−27	9500
R 12	0.4	+.25	−.23	+1	+6.5	+5.6	+12.3	−27	9600
R 12	0.4	+.27	−.25	+2	+6.6	+5.6	+12.5	−28	9700
R 12	0.4	+.29	−.27	+2	+6.6	+5.7	+12.7	−28	9800
R 13	0.4	+.31	−.28	+3	+6.7	+5.7	+12.9	−29	9900
R 13	0.5	+.33	−.30	+3	+6.7	+5.8	+13.1	−29	10000
R 13	0.5	+.36	−.32	+3	+6.8	+5.9	+13.3	−30	10100
R 14	0.5	+.40	−.35	+4	+6.8	+5.9	+13.5	−30	10200
R 14	0.5	+.44	−.38	+4	+6.9	+6.0	+13.8	−31	10300
R 15	0.5	+.49	−.41	+5	+6.9	+6.0	+14.0	−31	10400
R 15	0.5	+.56	−.45	+5	+7.0	+6.1	+14.2	−32	10500
R 16	0.5	+.64	−.50	+5	+7.0	+6.2	+14.4	−32	10600
R 16	0.5	+.73	−.56	+6	+7.1	+6.2	+14.6	−33	10700
R 16	0.5	+.84	−.63	+6	+7.1	+6.3	+14.9	−33	10800
R 17	0.5	+1.00	−.72	+7	+7.2	+6.3	+15.1	−34	10900
R 17	0.5	+1.24	−.83	+7	+7.2	+6.4	+15.3	−35	11000

*Drift includes side jump.

TABLE B

Change in velocity due to change in temperature of powder—

Temperature of powder, F.	0	10	20	30	40	50	60	70	80	90	100
Change in velocity, feet per second	−37	−32	−27	−21	−16	−11	−5	0	+5	+11	+16

TABLE C

Cant of carriage axle, deflection effect in mils due to—

Range, yards	1000	2000	3000	4000	5000	6000	7000	8000	9000
Cant of 10 mils, effect	0.3	0.6	1.0	1.4	1.9	2.4	3.0	3.7	4.5

Range, yards	9000	10000	10500	11000	11100	11200	11300	11400	11460
Cant of 10 mils, effect	4.5	5.6	6.3	7.3	7.6	7.9	8.3	8.9	10.0

NOTE.—Right wheel above left causes left deflection effect.

The deflection due to cant is automatically compensated for by cross leveling the sight, and this table is to be used only in the event the sight cannot be so used.

APPENDIX I

DATA CORRECTION SHEET

Target: _____ Date: _____ Hour: _____

Matériel: _____

INITIAL DATA

Map range_____ = _____ yards
Altitude of target_____ = _____ feet
Altitude of battery_____ = _____ "
Height of target_____ = _____ "
(/)_____ = _____ yards
Site_____ = _____ mils
Site correction_____ = _____ "
Corrected site_____ = _____ "

Map shift_____ = BD _____
Drift correction_____ = _____
Correction, weather_____ = _____
Initial deflection_____ = BD _____
Map range = ____ . El. = _____
Site_____ = _____
Range correction_____ = _____
Initial Q El_____ = _____

CHECK ADJUSTMENT

Adj Df on Ck Pt_____ = BD _____
Less Initial Df_____ = _____
Correction_____ = BD _____
(Correct laying by this amount and record new base deflection.)

Initial Q El_____ = _____
Less Adj Q El_____ = _____
Elevation change_____ = _____
Range change = ____ × ____ = _____

$VE\text{-change} = \frac{\text{Range change}}{\text{range effect of 1 f/s}}$

= / _____ = _____ f/s
Old *VE*_____ = _____ "
New *VE*_____ = _____ "

CORRECTIONS, MAP RANGE:

Altitude of MDP_____ = _____ 00 feet
Temperature of air_____ = _____ ° F.
Line No. of message_____ = _____
Wind direction_____ = _____ 00 mils
Wind velocity_____ = _____ MPH
Density_____ = _____ %
Battery _____ feet _____ MDP
{100 feet above = −.2° F. temp.
" " " = −.3 % density}

Cor. temp. = −59 = _____ °
Cor. dens. = −100 = _____ %

WIND COMPONENTS

Direction of wind_____ = _____ 00 mils
(Add 6400 if necessary)
Direction of fire_____ = _____ 00 "
Chart direction_____ = _____ 00 "
Cross wind for 1 MPH = _____
Range wind for 1 MPH = _____

DEFLECTION

Known values	Unit effect	L	R
Cross wind = ____ MPH			

RANGE

Known values	Unit effect	+	−
Wt. of proj. =			
Old *VE* = f/s			
Pow. temp. = ° F. = f/s			
Air temp = °F.			
Rn. wind = MPH			
Density = %			
Totals			

Net effect, yards_____ = _____
Correction = / = _____ mils

DATA CORRECTION SHEET

Target: Check point Date: 2/18/39 Hour: 6:00 AM

Matériel: 75-mm M2 Shell Mark I, Normal Charge, Fuze M46.

INITIAL DATA

Map range	= 4575	yards
Altitude of target	= 1665	feet
Altitude of battery	= 1505	"
Height of target	= + 160	"
(160/3)	= + 53	yards
Site 53/4.6	= + 11.5	mils
Site correction	= + 0.5	"
Corrected site	= + 12.0	"

Map shift	= BD	R 50
Drift correction	=	L 5
Correction, weather	=	R 7
Initial deflection	= BD	R 52
Map range = 4575. El	=	160.7
Site	=	+ 12.0
Range correction	=	+ 2.6
Initial Q El	=	175.3

CHECK ADJUSTMENT

Adj Df on Ck Pt	= BD	R 56
Less Initial Df	=	R 52
Correction	= BD	R 4

(Correct laying by this amount and record new base deflection.)

Initial Q El	= 175.3
Less Adj Q El	= 173.2
Elevation change	= 2.1
Range change = 2.1 × 17	= + 36

$$VE \text{ change} = \frac{\text{Range change}}{\text{range effect of 1 f/s}}$$

= 36/2.0 = +18 f/s

Old *VE* = +32 "

New *VE* = +50 "

CORRECTIONS, MAP RANGE: 4600

Altitude of MDP	= 12 00 feet
Temperature of air	= 35 ° F.
Line No. of message	= 2
Wind direction	= 59 00 mils
Wind velocity	= 29 MPH
Density	= 96 %

Battery 300 feet above MDP

{100 feet above = −.2° F. temp.
" " " = −.3 % density}

Cor. temp. = 34 − 59 = −25°

Cor. dens. = 95 − 100 = − 5%

WIND COMPONENTS

Direction of wind	= 59 00 mils
(Add 6400 if necessary)	
Direction of fire	= 49 00 "
Chart direction	= 10 00 "
Cross wind for 1 MPH	= L .83
Range wind for 1 MPH	= − .56

DEFLECTION

Known values	Unit effect	L	R
Cross wind = L 24 MPH	.3	7	

RANGE

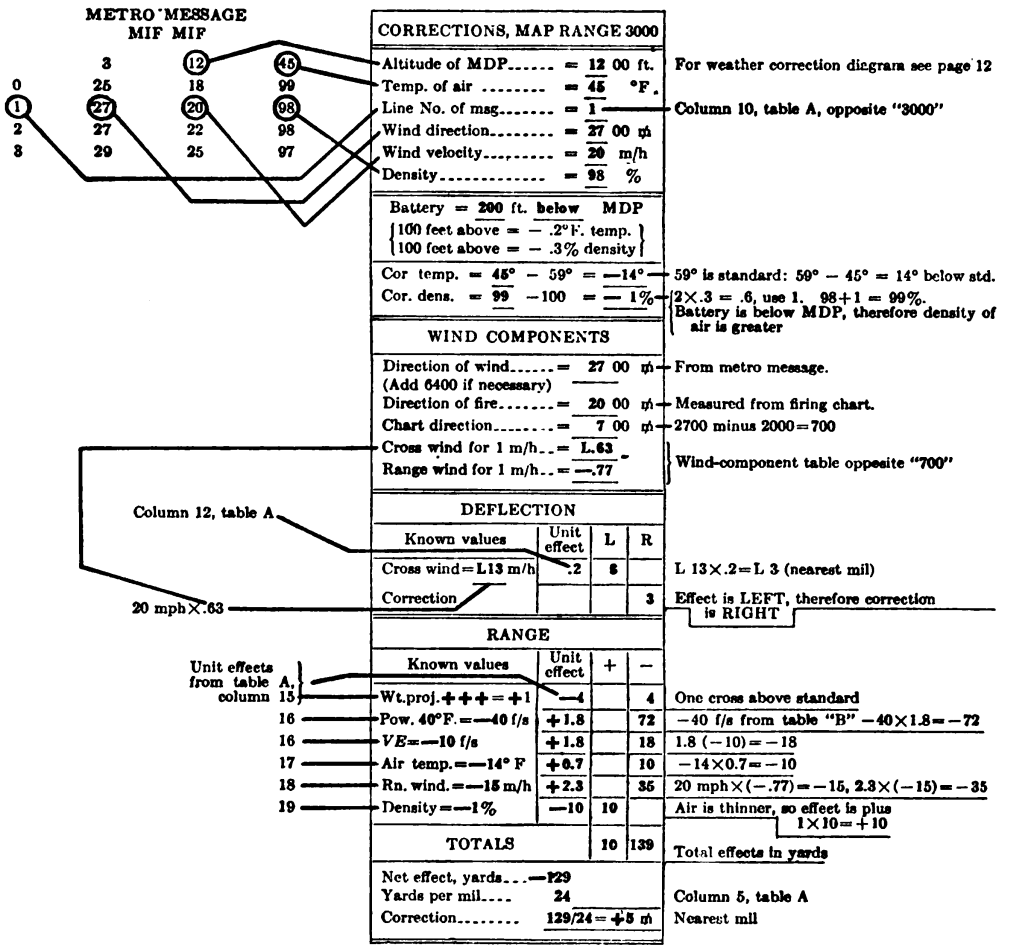
Known values	Unit effect	+	−
Wt. of proj. = +++	+11	11	
Old *VE* = +32 f/s	+2.0	64	
Pow. temp. = 40° F. = −40 f/s	+2.0		80
Air temp. = −25° F.	+1.6		40
Rn. wind = −16 MPH	+5.3		85
Density = −5%	−17	85	
Totals		160	205

Net effect, yards = −45

Correction = 45/17 = +2.6 mils

APPENDIX II

DATA CORRECTION SHEET



APPENDIX III

CONDENSED TABLE OF MAXIMUM ORDINATES (feet)

Range yards	75-mm gun		155-mm howitzer			
	Shrapnel, 21 seconds, normal charge	Shell Mk. I, fuzes M46 and M47, normal charge	Shell Mk. I, fuze M46 and M47			
			Charge 3	Charge 4	Charge 5	Charge 6
1000	16	16	54	42	46	20
2000	75	79	229	178	153	95
3000	213	229	551	423	339	236
4000	451	501	1079	806	624	450
5000	814	930	1970	1375	1032	782
6000	1347	1569		2231	1597	1218
7000	2129	2507		3769	2378	1795
8000	3257	3943			3498	2545
9000	5055	7010			5430	3518
10,000						4822

APPENDIX IV

EQUIVALENT EROSION EFFECTS

75-mm gun		
Projectile	Number of rounds equivalent in erosion effect to one round full charge	Equivalent erosion effects in decimals
Shrapnel	1	1
Shell Mk. I normal charge	2	.5
Shell Mk. I reduced charge	30	.033

155-mm howitzer		
Charge	Number of rounds equivalent in erosion effect to one full charge	Equivalent erosion effects in decimals
1	120	. 0083
2	70	. 014
3	40	. 025
4	20	. 050
5	10	. 10
6	3	. 3
7	1	1. 0

[A. G. 062.11 (9–5–40).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1940